Breast Cancer

What is cancer?

The body is made up of hundreds of millions of living cells. Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn’t die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called metastasis. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

No matter where a cancer may spread, it is always named for the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is metastatic prostate cancer, not bone cancer.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

Not all tumors are cancerous. Tumors that aren't cancer are called benign. Benign tumors can cause problems – they can grow very large and press on healthy organs and tissues. But they cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is breast cancer?

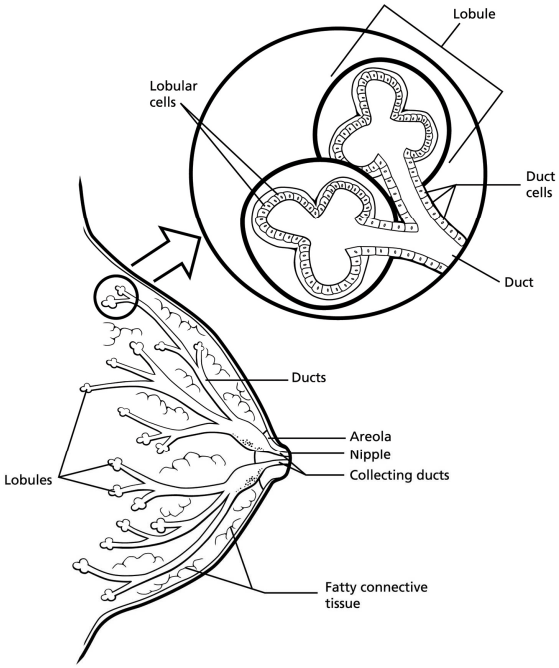
Breast cancer is a malignant tumor that starts from cells of the breast. A malignant tumor is a group of cancer cells that may grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. The disease occurs almost entirely in women, but men can get it, too.

The remainder of this document refers only to breast cancer in women. For information on breast cancer in men, see our document, ***Breast Cancer in Men*****.**

The normal breast

To understand breast cancer, it helps to have some basic knowledge about the normal structure of the breasts, shown in the diagram below.

The female breast is made up mainly of *lobules* (milk-producing glands), *ducts* (tiny tubes that carry the milk from the lobules to the nipple), and *stroma* (fatty tissue and connective tissue surrounding the ducts and lobules, blood vessels, and lymphatic vessels).



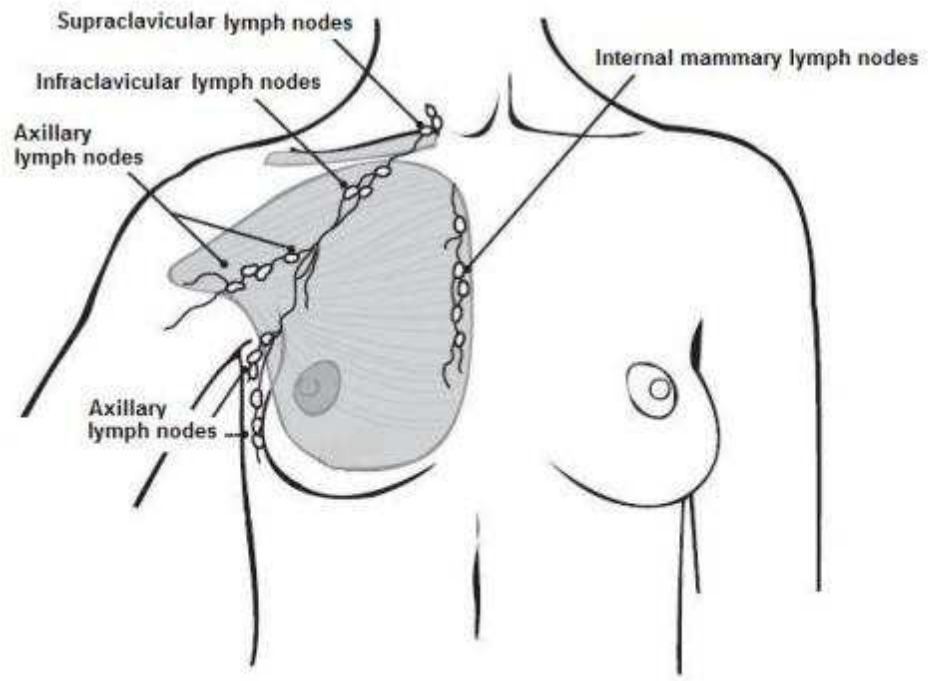
Most breast cancers begin in the cells that line the ducts (*ductal* cancers). Some begin in the cells that line the lobules (*lobular* cancers), while a small number start in other tissues.

The lymph (lymphatic) system

The lymph system is important to understand because it is one of the ways in which breast cancers can spread. This system has several parts.

Lymph nodes are small, bean-shaped collections of immune system cells (cells that are important in fighting infections) that are connected by lymphatic vessels. Lymphatic vessels are like small veins, except that they carry a clear fluid called lymph (instead of blood) away from the breast. Lymph contains tissue fluid and waste products, as well as immune system cells. Breast cancer cells can enter lymphatic vessels and begin to grow in lymph nodes.

Most lymphatic vessels in the breast connect to lymph nodes under the arm (*axillary nodes*). Some lymphatic vessels connect to lymph nodes inside the chest (*internal mammary nodes*) and those either above or below the collarbone (*supraclavicular* or *infraclavicular nodes*).



It is important to find out if the cancer cells have spread to lymph nodes because if they have, there is a higher chance that the cells could have also gotten into the bloodstream and spread (metastasized) to other sites in the body. The more lymph nodes that have breast cancer, the more likely it is that the cancer may be found in other organs as well. This is important to know because it could affect your treatment plan. Still, not all women with cancer cells in their lymph nodes develop metastases, and some women can have no cancer cells in their lymph nodes and later develop metastases.

Benign breast lumps

Most breast lumps are not cancerous (benign). Still, some may need to be sampled and viewed under a microscope to prove they are not cancer.

Fibrocystic changes

Most lumps turn out to be fibrocystic changes. The term *fibrocystic* refers to fibrosis and cysts. Fibrosis is the formation of scar-like (fibrous) tissue, and cysts are fluid-filled sacs. Fibrocystic changes can cause breast swelling and pain. This often happens just before a woman's menstrual period is about to begin. Her breasts may feel lumpy and, sometimes, she may notice a clear or slightly cloudy nipple discharge.

Other benign breast lumps

Benign breast tumors such as *fibroadenomas* or *intraductal papillomas* are abnormal growths, but they are not cancerous and do not spread outside of the breast to other organs. They are not life threatening. Still, some benign breast conditions are important because women with these conditions have a higher risk of developing breast cancer.

For more information see the section, "What are the risk factors for breast cancer?" and our document, *Non-cancerous Breast Conditions*.

General breast cancer terms

It is important to understand some of the key words used to describe breast cancer.

Carcinoma

This is a term used to describe a cancer that begins in the lining layer (epithelial cells) of organs like the breast. Nearly all breast cancers are carcinomas (either ductal carcinomas or lobular carcinomas).

Adenocarcinoma

An adenocarcinoma is a type of carcinoma that starts in glandular tissue (tissue that makes and secretes a substance). The ducts and lobules of the breast are glandular tissue (they make breast milk), so cancers starting in these areas are often called adenocarcinomas.

Carcinoma in situ

This term is used for the early stage of cancer, when it is confined to the layer of cells where it began. In breast cancer, *in situ* means that the cancer cells remain confined to ducts (ductal carcinoma in situ) or lobules (lobular carcinoma in situ). They have not grown into (*invaded*) deeper tissues in the breast or spread to other organs in the body. Carcinoma in situ of the breast is sometimes referred to as *non-invasive* or *pre-invasive* breast cancer.

Invasive (infiltrating) carcinoma

An invasive cancer is one that has already grown beyond the layer of cells where it started (as opposed to carcinoma in situ). Most breast cancers are invasive carcinomas -- either invasive ductal carcinoma or invasive lobular carcinoma.

Sarcoma

Sarcomas are cancers that start from connective tissues such as muscle tissue, fat tissue, or blood vessels. Sarcomas of the breast are rare.

Types of breast cancers

There are several types of breast cancer, but some of them are quite rare. In some cases a single breast tumor can have a combination of these types or have a mixture of invasive and in situ cancer.

Ductal carcinoma in situ

Ductal carcinoma in situ (DCIS; also known as *intraductal carcinoma*) is the most common type of non-invasive breast cancer. DCIS means that the cancer cells are inside the ducts but have not spread through the walls of the ducts into the surrounding breast tissue.

About 1 in 5 new breast cancer cases will be DCIS. Nearly all women diagnosed at this early stage of breast cancer can be cured. A mammogram is often the best way to find DCIS early.

When DCIS is diagnosed, the pathologist (a doctor specializing in diagnosing disease from tissue samples) will look for areas of dead or dying cancer cells, called *tumor necrosis*, within the tissue sample. If necrosis is present, the tumor is likely to be more aggressive. The term *comedocarcinoma* is often used to describe DCIS with necrosis.

Lobular carcinoma in situ

Although it is not a true cancer, lobular carcinoma in situ (LCIS; also called *lobular neoplasia*) is sometimes classified as a type of non-invasive breast cancer, which is why it is included here. It begins in the milk-producing glands but does not grow through the wall of the lobules.

Most breast cancer specialists think that LCIS itself does not become an invasive cancer very often, but women with this condition do have a higher risk of developing an invasive breast cancer in the same breast or in the opposite breast. For this reason, women with LCIS should make sure they have regular mammograms and doctor visits.

Invasive (or infiltrating) ductal carcinoma

This is the most common type of breast cancer. Invasive (or infiltrating) ductal carcinoma (IDC) starts in a milk passage (duct) of the breast, breaks through the wall of the duct, and grows into the fatty tissue of the breast. At this point, it may be able to spread (metastasize) to other parts of the body through the lymphatic system and bloodstream. About 8 of 10 invasive breast cancers are infiltrating ductal carcinomas.

Invasive (or infiltrating) lobular carcinoma

Invasive lobular carcinoma (ILC) starts in the milk-producing glands (lobules). Like IDC, it can spread (metastasize) to other parts of the body. About 1 out of 10 invasive breast cancers is an ILC. Invasive lobular carcinoma may be harder to detect by a mammogram than invasive ductal carcinoma.

Less common types of breast cancer

Inflammatory breast cancer: This uncommon type of invasive breast cancer accounts for about 1% to 3% of all breast cancers. Usually there is no single lump or tumor. Instead, inflammatory breast cancer (IBC) makes the skin of the breast look red and feel warm. It also gives the breast skin a thick, pitted appearance that looks a lot like an orange peel. Doctors now know that these changes are not caused by inflammation or infection, but by cancer cells blocking lymph vessels in the skin. The affected breast may become larger or firmer, tender, or itchy. In its early stages, inflammatory breast cancer is often mistaken for an infection in the breast (called *mastitis*). Often this cancer is first treated as an infection with antibiotics. If the symptoms are caused by cancer, they will not improve, and the skin may be biopsied to look for cancer cells. Because there is no actual lump, it may not show up on a mammogram, which may make it even harder to find it early. This type of breast cancer tends to have a higher chance of spreading and a worse outlook than typical invasive ductal or lobular cancer. For more details about this condition, see our document, *Inflammatory Breast Cancer*.

Triple-negative breast cancer: This term is used to describe breast cancers (usually invasive ductal carcinomas) whose cells lack estrogen receptors and progesterone receptors, and do not have an excess of the HER2 protein on their surfaces. (See the section, "How is breast cancer diagnosed?" for more detail on these receptors.) Breast cancers with these characteristics tend to occur more often in younger women and in African-American women. Triple-negative breast cancers tend to grow and spread more quickly than most other types of breast cancer. Because the tumor cells lack these certain receptors, neither hormone therapy nor drugs that target HER2 are effective against these cancers (but chemotherapy can still be useful if needed).

Mixed tumors: Mixed tumors contain a variety of cell types, such as invasive ductal cancer combined with invasive lobular breast cancer. In this situation, the tumor is treated as if it were an invasive ductal cancer.

Medullary carcinoma: This special type of infiltrating breast cancer has a rather well-defined boundary between tumor tissue and normal tissue. It also has some other special features, including the large size of the cancer cells and the presence of immune system cells at the edges of the tumor. Medullary carcinoma accounts for about 3% to 5% of breast cancers. The outlook (prognosis) for this kind of breast cancer is generally better than for the more common types of invasive breast cancer. Most cancer specialists think that true medullary cancer is very rare, and that cancers that are called medullary cancer should be treated as the usual invasive ductal breast cancer.

Metaplastic carcinoma: Metaplastic carcinoma (also known as carcinoma with metaplasia) is a very rare type of invasive ductal cancer. These tumors include cells that are normally not found in the breast, such as cells that look like skin cells (squamous cells) or cells that make bone. These tumors are treated like invasive ductal cancer.

Mucinous carcinoma: Also known as colloid carcinoma, this rare type of invasive breast cancer is formed by mucus-producing cancer cells. The prognosis for mucinous

carcinoma is usually better than for the more common types of invasive breast cancer. Still, it is treated like invasive ductal carcinoma.

Paget disease of the nipple: This type of breast cancer starts in the breast ducts and spreads to the skin of the nipple and then to the areola, the dark circle around the nipple. It is rare, accounting for only about 1% of all cases of breast cancer. The skin of the nipple and areola often appears crusted, scaly, and red, with areas of bleeding or oozing. The woman may notice burning or itching.

Paget disease is almost always associated with either ductal carcinoma in situ (DCIS) or, more often, with infiltrating ductal carcinoma. Treatment often requires mastectomy. If only DCIS is found (with no invasive cancer) when the breast is removed, the outlook is excellent.

Tubular carcinoma: Tubular carcinomas are another special type of invasive ductal breast carcinoma. They are called tubular because of the way the cells are arranged when seen under the microscope. Tubular carcinomas account for about 2% of all breast cancers. They are treated like invasive ductal carcinomas, but tend to have a better prognosis than most breast cancers.

Papillary carcinoma: The cells of these cancers tend to be arranged in small, finger-like projections when viewed under the microscope. These tumors can be separated into non-invasive and invasive types. Intraductal papillary carcinoma or papillary carcinoma in situ is non-invasive. It is often considered a subtype of ductal carcinoma in situ (DCIS), and is treated as such. In rare cases, the tumor is invasive, in which case it is treated like invasive ductal carcinoma, although the outlook is likely to be better. These cancers tend to be diagnosed in older women, and they make up no more than 1% or 2% of all breast cancers.

Adenoid cystic carcinoma (adenocystic carcinoma): These cancers have both glandular (adenoid) and cylinder-like (cystic) features when seen under the microscope. They make up less than 1% of breast cancers. They rarely spread to the lymph nodes or distant areas, and they tend to have a very good prognosis.

Phyllodes tumor: This very rare breast tumor develops in the stroma (connective tissue) of the breast, in contrast to carcinomas, which develop in the ducts or lobules. Other names for these tumors include *phylloides tumor* and *cystosarcoma phyllodes*. These tumors are usually benign but on rare occasions may be malignant.

Benign phyllodes tumors are treated by removing the tumor along with a margin of normal breast tissue. A malignant phyllodes tumor is treated by removing it along with a wider margin of normal tissue, or by mastectomy. Surgery is often all that is needed, but these cancers may not respond as well to the other treatments used for more common breast cancers. When a malignant phyllodes tumor has spread, it may be treated with the chemotherapy given for soft-tissue sarcomas (this is discussed in detail in our document, *Soft-tissue Sarcomas.*

Angiosarcoma: This is a form of cancer that starts from cells that line blood vessels or lymph vessels. It rarely occurs in the breasts. When it does, it usually develops as a

complication of previous radiation treatments. This is an extremely rare complication of breast radiation therapy that can develop about 5 to 10 years after radiation. Angiosarcoma can also occur in the arm of women who develop lymphedema as a result of lymph node surgery or radiation therapy to treat breast cancer. (For information on lymphedema, see the section, "How is breast cancer treated?") These cancers tend to grow and spread quickly. Treatment is generally the same as for other sarcomas. See our document, *Sarcoma - Adult Soft Tissue Cancer.*

What are the key statistics about breast cancer?

Breast cancer is the most common cancer among American women, except for skin cancers. The chance of developing invasive breast cancer at some time in a woman's life is a little less than 1 in 8 (12%).

The American Cancer Society's most recent estimates for breast cancer in the United States are for 2011:

- About 230,480 new cases of invasive breast cancer will be diagnosed in women.
- About 57,650 new cases of carcinoma in situ (CIS) will be diagnosed (CIS is non-invasive and is the earliest form of breast cancer).
- About 39,520 women will die from breast cancer

After increasing for more than 2 decades, female breast cancer incidence rates decreased by about 2% per year from 1998 to 2007. This decrease was seen only in women aged 50 or older, and may be due at least in part to the decline in use of hormone therapy after menopause that occurred after the results of the Women's Health Initiative were published in 2002. This study linked the use of hormone therapy to an increased risk of breast cancer and heart diseases.

Breast cancer is the second leading cause of cancer death in women, exceeded only by lung cancer. The chance that breast cancer will be responsible for a woman's death is about 1 in 35 (about 3%). Death rates from breast cancer have been declining since about 1990, with larger decreases in women younger than 50. These decreases are believed to be the result of earlier detection through screening and increased awareness, as well as improved treatment.

At this time there are over 2.5 million breast cancer survivors in the United States. (This includes women still being treated and those who have completed treatment.) Survival rates are discussed in the section "How is breast cancer staged?"

What are the risk factors for breast cancer?

A risk factor is anything that affects your chance of getting a disease, such as cancer. Different cancers have different risk factors. For example, exposing skin to strong

sunlight is a risk factor for skin cancer. Smoking is a risk factor for cancers of the lung, mouth, larynx (voice box), bladder, kidney, and several other organs.

But risk factors don't tell us everything. Having a risk factor, or even several, does not mean that you will get the disease. Most women who have one or more breast cancer risk factors never develop the disease, while many women with breast cancer have no apparent risk factors (other than being a woman and growing older). Even when a woman with risk factors develops breast cancer, it is hard to know just how much these factors may have contributed to her cancer.

There are different kinds of risk factors. Some factors, like a person's age or race, can't be changed. Others are linked to cancer-causing factors in the environment. Still others are related personal behaviors, such as smoking, drinking, and diet. Some factors influence risk more than others, and your risk for breast cancer can change over time, due to factors such as aging or lifestyle.

Risk factors you cannot change

Gender

Simply being a woman is the main risk factor for developing breast cancer. Although women have many more breast cells than men, the main reason they develop more breast cancer is because their breast cells are constantly exposed to the growth-promoting effects of the female hormones estrogen and progesterone. Men can develop breast cancer, but this disease is about 100 times more common among women than men.

Aging

Your risk of developing breast cancer increases as you get older. About 1 out of 8 invasive breast cancers are found in women younger than 45, while about 2 out of 3 invasive breast cancers are found in women age 55 or older.

Genetic risk factors

About 5% to 10% of breast cancer cases are thought to be hereditary, resulting directly from gene defects (called *mutations*) inherited from a parent. See the section, "Do we know what causes breast cancer?" for more information about genes and DNA.

BRCA1 and BRCA2: The most common cause of hereditary breast cancer is an inherited mutation in the BRCA1 and BRCA2 genes. In normal cells, these genes help prevent cancer by making proteins that help keep the cells from growing abnormally. If you have inherited a mutated copy of either gene from a parent, you have a high risk of developing breast cancer during your lifetime. The risk may be as high as 80% for members of some families with BRCA mutations. These cancers tend to occur in younger women and more often affect both breasts than cancers in women who are not born with one of these gene mutations. Women with these inherited mutations also have an increased risk for developing other cancers, particularly ovarian cancer.

In the United States BRCA mutations are found most often in Jewish women of Ashkenazi (Eastern Europe) origin, but they can occur in any racial or ethnic group.

Changes in other genes: Other gene mutations can also lead to inherited breast cancers. These gene mutations are much rarer and often do not increase the risk of breast cancer as much as the BRCA genes. They are not frequent causes of inherited breast cancer.

- ATM: The ATM gene normally helps repair damaged DNA. Inheriting 2 abnormal copies of this gene causes the disease ataxia-telangiectasia. Inheriting one mutated copy of this gene has been linked to a high rate of breast cancer in some families.
- p53: Inherited mutations of the p53 tumor suppressor gene cause the Li-Fraumeni syndrome (named after the 2 researchers who first described it). People with this syndrome have an increased the risk of developing breast cancer, as well as several other cancers such as leukemia, brain tumors, and sarcomas (cancer of bones or connective tissue). This is a rare cause of breast cancer.
- CHEK2: The Li-Fraumeni syndrome can also be caused by inherited mutations in the CHEK2 gene. Even when it does not cause this syndrome, it can increase breast cancer risk about twofold when it is mutated.
- PTEN: The PTEN gene normally helps regulate cell growth. Inherited mutations in this gene cause Cowden syndrome, a rare disorder in which people are at increased risk for both benign and malignant breast tumors, as well as growths in the digestive tract, thyroid, uterus, and ovaries.
- CDH1: Inherited mutations in this gene cause hereditary diffuse gastric cancer, a syndrome in which people develop a rare type of stomach cancer at an early age. Women with mutations in this gene also have an increased risk of invasive lobular breast cancer.

Genetic testing: Genetic tests can be done to look for mutations in the BRCA1 and BRCA2 genes (or less commonly in other genes such as PTEN or p53). Although testing may be helpful in some situations, the pros and cons need to be considered carefully. For more information, see the section, "Can breast cancer be prevented?"

Family history of breast cancer

Breast cancer risk is higher among women whose close blood relatives have this disease.

Having one first-degree relative (mother, sister, or daughter) with breast cancer approximately doubles a woman's risk. Having 2 first-degree relatives increases her risk about 3-fold.

The exact risk is not known, but women with a family history of breast cancer in a father or brother also have an increased risk of breast cancer. Altogether, less than 15% of women with breast cancer have a family member with this disease. This means that most (over 85%) women who get breast cancer *do not* have a family history of this disease.

Personal history of breast cancer

A woman with cancer in one breast has a 3- to 4-fold increased risk of developing a new cancer in the other breast or in another part of the same breast. This is different from a recurrence (return) of the first cancer.

Race and ethnicity

White women are slightly more likely to develop breast cancer than are African-American women. African-American women are more likely to die of this cancer. At least part of this seems to be because African-American women tend to have more aggressive tumors, although why this is the case is not known. Asian, Hispanic, and Native-American women have a lower risk of developing and dying from breast cancer.

Dense breast tissue

Women with denser breast tissue (as seen on a mammogram) have more glandular tissue and less fatty tissue, and have a higher risk of breast cancer. Unfortunately, dense breast tissue can also make it harder for doctors to spot problems on mammograms.

Certain benign breast conditions

Women diagnosed with certain benign breast conditions may have an increased risk of breast cancer. Some of these conditions are more closely linked to breast cancer risk than others. Doctors often divide benign breast conditions into 3 general groups, depending on how they affect this risk.

Non-proliferative lesions: These conditions are not associated with overgrowth of breast tissue. They do not seem to affect breast cancer risk, or if they do, it is to a very small extent. They include:

- Fibrocystic disease (fibrosis and/or cysts)
- Mild hyperplasia
- Adenosis (non-sclerosing)
- Duct ectasia
- Phyllodes tumor (benign)
- A single papilloma
- Fat necrosis
- Mastitis (infection of the breast)
- Simple fibroadenoma

- Other benign tumors (lipoma, hamartoma, hemangioma, neurofibroma)

Proliferative lesions without atypia: These conditions show excessive growth of cells in the ducts or lobules of the breast tissue. They seem to raise a woman's risk of breast cancer slightly (1½ to 2 times normal). They include:

- Usual ductal hyperplasia (without atypia)
- Complex fibroadenoma
- Sclerosing adenosis
- Several papillomas (called papillomatosis)
- Radial scar

Proliferative lesions with atypia: In these conditions, there is excessive growth of cells in the ducts or lobules of the breast tissue, and the cells no longer appear normal. They have a stronger effect on breast cancer risk, raising it 4 to 5 times higher than normal. They include:

- Atypical ductal hyperplasia (ADH)
- Atypical lobular hyperplasia (ALH)

Women with a family history of breast cancer and either hyperplasia or atypical hyperplasia have an even higher risk of developing a breast cancer.

For more information on these conditions, see our document, *Non-cancerous Breast Conditions*.

Lobular carcinoma in situ

Women with lobular carcinoma in situ (LCIS) have a 7- to 11-fold increased risk of developing cancer in either breast.

Menstrual periods

Women who have had more menstrual cycles because they started menstruating at an early age (before age 12) and/or went through menopause at a later age (after age 55) have a slightly higher risk of breast cancer. This may be related to a higher lifetime exposure to the hormones estrogen and progesterone.

Previous chest radiation

Women who, as children or young adults, had radiation therapy to the chest area as treatment for another cancer (such as Hodgkin disease or non-Hodgkin lymphoma) are at significantly increased risk for breast cancer. This varies with the patient's age when they had radiation. If chemotherapy was also given, it may have stopped ovarian hormone production for some time, lowering the risk. The risk of developing breast cancer from chest radiation is highest if the radiation was given during adolescence, when the breasts

were still developing. Radiation treatment after age 40 does not seem to increase breast cancer risk.

Diethylstilbestrol exposure

From the 1940s through the 1960s some pregnant women were given the drug diethylstilbestrol (DES) because it was thought to lower their chances of miscarriage (losing the baby). These women have a slightly increased risk of developing breast cancer. Women whose mothers took DES during pregnancy may also have a slightly higher risk of breast cancer. For more information on DES see our document, *DES Exposure: Questions and Answers*.

Lifestyle-related factors and breast cancer risk

Having children

Women who have had no children or who had their first child after age 30 have a slightly higher breast cancer risk. Having many pregnancies and becoming pregnant at a young age reduce breast cancer risk. Pregnancy reduces a woman's total number of lifetime menstrual cycles, which may be the reason for this effect.

Recent oral contraceptive use

Studies have found that women using oral contraceptives (birth control pills) have a slightly greater risk of breast cancer than women who have never used them. This risk seems to decline back to normal over time once the pills are stopped. Women who stopped using oral contraceptives more than 10 years ago do not appear to have any increased breast cancer risk. When thinking about using oral contraceptives, women should discuss their other risk factors for breast cancer with their health care team.

Hormone therapy after menopause

Hormone therapy with estrogen (sometimes with progesterone) has been used for many years to help relieve symptoms of menopause and to help prevent osteoporosis (thinning of the bones). Earlier studies suggested it might have other health benefits as well, but these benefits have not been found in more recent, better designed studies. This treatment goes by many names, such as *post-menopausal hormone therapy* (PHT), *hormone replacement therapy* (HRT), and *menopausal hormone therapy* (MHT).

There are 2 main types of hormone therapy. For women who still have a uterus (womb), doctors generally prescribe both estrogen and progesterone (known as *combined hormone therapy* or *HT*). Because estrogen alone can increase the risk of cancer of the uterus, progesterone is added to help prevent this. For women who no longer have a uterus (those who've had a hysterectomy), estrogen alone can be prescribed. This is commonly known as *estrogen replacement therapy* (ERT) or just *estrogen therapy (ET)*.

Combined hormone therapy: Using combined hormone therapy after menopause increases the risk of getting breast cancer. It may also increase the chances of dying from breast cancer. This increase in risk can be seen with as little as 2 years of use. Combined HT also increases the likelihood that the cancer may be found at a more advanced stage, possibly because it reduces the effectiveness of mammograms by increasing breast density.

The increased risk from combined hormone therapy appears to apply only to current and recent users. A woman's breast cancer risk seems to return to that of the general population within 5 years of stopping combined treatment.

The word "bioidentical" is sometimes used to describe hormones that contain estrogens or progestins with the same chemical structure as those found naturally in people. "Bioidentical" or "natural" hormones that contain estrogens or progestins must be prescribed, just as other hormone drugs are, and should be assumed to have the same health risks as they do.

ET: The use of estrogen alone after menopause does not appear to increase the risk of developing breast cancer significantly, if at all. But when used long term (for more than 10 years), ERT has been found to increase the risk of ovarian and breast cancer in some studies.

At this time there appear to be few strong reasons to use post-menopausal hormone therapy (either combined HT or ET), other than possibly for the short-term relief of menopausal symptoms. Along with the increased risk of breast cancer, combined HT also appears to increase the risk of heart disease, blood clots, and strokes. It does lower the risk of colorectal cancer and osteoporosis, but this must be weighed against possible harm, especially since there are other effective ways to prevent and treat osteoporosis. Although ET does not seem to have much effect on breast cancer risk, it does increase the risk of stroke.

The decision to use hormone therapy after menopause should be made by a woman and her doctor after weighing the possible risks and benefits, based on the severity of her menopausal symptoms and the woman's other risk factors for heart disease, breast cancer, and osteoporosis. If a woman and her doctor decide to try hormones for symptoms of menopause, it is usually best to use it at the lowest dose needed to control symptoms and for as short a time as possible.

Breast-feeding

Some studies suggest that breast-feeding may slightly lower breast cancer risk, especially if breast-feeding is continued for 1½ to 2 years. But this has been a difficult area to study, especially in countries such as the United States, where breast-feeding for this long is uncommon.

The explanation for this possible effect may be that breast-feeding reduces a woman's total number of lifetime menstrual cycles (similar to starting menstrual periods at a later age or going through early menopause).

Alcohol

The use of alcohol is clearly linked to an increased risk of developing breast cancer. The risk increases with the amount of alcohol consumed. Compared with non-drinkers, women who consume 1 alcoholic drink a day have a very small increase in risk. Those who have 2 to 5 drinks daily have about 1½ times the risk of women who drink no alcohol. Excessive alcohol use is also known to increase the risk of developing cancers of the mouth, throat, esophagus, and liver. The American Cancer Society recommends that women limit their consumption of alcohol to no more than one drink a day.

Being overweight or obese

Being overweight or obese has been found to increase breast cancer risk, especially for women after menopause. Before menopause your ovaries produce most of your estrogen, and fat tissue produces a small amount of estrogen. After menopause (when the ovaries stop making estrogen), most of a woman's estrogen comes from fat tissue. Having more fat tissue after menopause can increase your chance of getting breast cancer by raising estrogen levels. Also, women who are overweight tend to have higher blood insulin levels. Higher insulin levels have also been linked to some cancers, including breast cancer.

But the connection between weight and breast cancer risk is complex. For example, the risk appears to be increased for women who gained weight as an adult but may not be increased among those who have been overweight since childhood. Also, excess fat in the waist area may affect risk more than the same amount of fat in the hips and thighs. Researchers believe that fat cells in various parts of the body have subtle differences that may explain this.

The American Cancer Society recommends you maintain a healthy weight throughout your life by balancing your food intake with physical activity and avoiding excessive weight gain.

Physical activity

Evidence is growing that physical activity in the form of exercise reduces breast cancer risk. The main question is how much exercise is needed. In one study from the Women's Health Initiative (WHI) as little as 1.25 to 2.5 hours per week of brisk walking reduced a woman's risk by 18%. Walking 10 hours a week reduced the risk a little more.

To reduce your risk of breast cancer, the American Cancer Society recommends 45 to 60 minutes of intentional physical activity 5 or more days a week.

Factors with uncertain, controversial, or unproven effect on breast cancer risk

Diet and vitamin intake

Many studies have looked for a link between certain diet and breast cancer risk, but so far the results have been conflicting. Some studies have indicated that diet may play a role, while others found no evidence that diet influences breast cancer risk. Studies have looked at the amount of fat in the diet, intake of fruits and vegetables, and intake of meat. No clear link to breast cancer risk was found. Studies have also looked at vitamin levels, again with inconsistent results. Some studies actually found an increased risk of breast cancer in women with higher levels of certain nutrients. Also, so far, no study has shown that taking vitamins reduces breast cancer risk. This is not to say that there is no point in eating a healthy diet. A diet low in fat, low in red meat and processed meat, and high in fruits and vegetables may have other health benefits.

Most studies have found that breast cancer is less common in countries where the typical diet is low in total fat, low in polyunsaturated fat, and low in saturated fat. On the other hand, many studies of women in the United States have not found breast cancer risk to be related to dietary fat intake. Researchers are still not sure how to explain this apparent disagreement. It may be at least partly due to the effect of diet on body weight (see below). Also, studies comparing diet and breast cancer risk in different countries are complicated by other differences (like activity level, intake of other nutrients, and genetic factors) that might also change breast cancer risk.

More research is needed to better understand the effect of the types of fat eaten on breast cancer risk. But it is clear that calories do count, and fat is a major source of these. High-fat diets can lead to being overweight or obese, which is a breast cancer risk factor. A diet high in fat has also been shown to influence the risk of developing several other types of cancer, and intake of certain types of fat is clearly related to heart disease risk.

The American Cancer Society recommends eating a healthy diet with an emphasis on plant sources. This includes eating 5 or more servings of vegetables and fruits each day, choosing whole grains over those that are processed (refined), and limiting consumption of processed and red meats.

Antiperspirants

Internet e-mail rumors have suggested that chemicals in underarm antiperspirants are absorbed through the skin, interfere with lymph circulation, cause toxins to build up in the breast, and eventually lead to breast cancer. There is very little laboratory or population-based evidence to support this rumor.

One small study has found trace levels of parabens (used as preservatives in antiperspirants and other products), which have weak estrogen-like properties, in a small sample of breast cancer tumors. But this study did not look at whether parabens caused the tumors. This was a preliminary finding, and more research is needed to determine

what effect, if any, parabens may have on breast cancer risk. On the other hand, a large study of breast cancer causes found no increase in breast cancer in women who used underarm antiperspirants and/or shaved their underarms.

Bras

Internet e-mail rumors and at least one book have suggested that bras cause breast cancer by obstructing lymph flow. There is no good scientific or clinical basis for this claim. Women who do not wear bras regularly are more likely to be thinner or have less dense breasts, which would probably contribute to any perceived difference in risk.

Induced abortion

Several studies have provided very strong data that neither induced abortions nor spontaneous abortions (miscarriages) have an overall effect on the risk of breast cancer. For more detailed information, see our document, *Is Abortion Linked to Breast Cancer?*

Breast implants

Several studies have found that breast implants do not increase breast cancer risk, although silicone breast implants can cause scar tissue to form in the breast. Implants make it harder to see breast tissue on standard mammograms, but additional x-ray pictures called implant displacement views can be used to examine the breast tissue more completely.

Chemicals in the environment

A great deal of research has been reported and more is being done to understand possible environmental influences on breast cancer risk.

Of special interest are compounds in the environment that have been found in lab studies to have estrogen-like properties, which could in theory affect breast cancer risk. For example, substances found in some plastics, certain cosmetics and personal care products, pesticides (such as DDE), and PCBs (polychlorinated biphenyls) seem to have such properties.

This issue understandably invokes a great deal of public concern, but at this time research does not show a clear link between breast cancer risk and exposure to these substances. Unfortunately, studying such effects in humans is difficult. More research is needed to better define the possible health effects of these and similar substances.

Tobacco smoke

Most studies have found no link between cigarette smoking and breast cancer. Some studies have suggested smoking increases the risk of breast cancer, but this remains controversial.

An active focus of research is whether secondhand smoke increases the risk of breast cancer. Both mainstream and secondhand smoke contain chemicals that, in high concentrations, cause breast cancer in rodents. Chemicals in tobacco smoke reach breast tissue and are found in breast milk.

The evidence on secondhand smoke and breast cancer risk in human studies is controversial, at least in part because smokers have not been shown to be at increased risk. One possible explanation for this is that tobacco smoke may have different effects on breast cancer risk in smokers and in those who are just exposed to smoke.

A report from the California Environmental Protection Agency in 2005 concluded that the evidence about secondhand smoke and breast cancer is "consistent with a causal association" in younger, mainly premenopausal women. The 2006 US Surgeon General's report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke*, concluded that there is "suggestive but not sufficient" evidence of a link at this point. In any case, this possible link to breast cancer is yet another reason to avoid secondhand smoke.

Night work

Several studies have suggested that women who work at night -- for example, nurses on a night shift -- may have an increased risk of developing breast cancer. This is a fairly recent finding, and more studies are looking at this issue. Some researchers think the effect may be due to changes in levels of melatonin, a hormone whose production is affected by the body's exposure to light, but other hormones are also being studied.

Do we know what causes breast cancer?

Many risk factors may increase your chance of developing breast cancer, but it is not yet known exactly how some of these risk factors cause cells to become cancerous. Hormones seem to play a role in many cases of breast cancer, but just how this happens is not fully understood.

Certain changes in DNA can cause normal breast cells to become cancerous. DNA is the chemical in each of our cells that makes up our genes -- the instructions for how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than how we look.

Some genes contain instructions for controlling when our cells grow, divide, and die. Certain genes that speed up cell division are called *oncogene*s. Others that slow down cell division, or cause cells to die at the right time, are called *tumor suppressor genes*. Cancers can be caused by DNA mutations (changes) that "turn on" oncogenes or "turn off" tumor suppressor genes.

Inherited gene mutations

Certain inherited DNA changes can increase the risk for developing cancer and are responsible for the cancers that run in some families. For example, the BRCA genes

(BRCA1 and BRCA2) are tumor suppressor genes. Mutations in these genes can be inherited from parents. When they are mutated, they no longer suppress abnormal growth, and cancer is more likely to develop.

Women have already begun to benefit from advances in understanding the genetic basis of breast cancer. Genetic testing can identify some women who have inherited mutations in the BRCA1 or BRCA2 tumor suppressor genes (or less commonly in other genes such as PTEN or p53). These women can then take steps to reduce their risk of developing breast cancers and to monitor changes in their breasts carefully to find cancer at an earlier, more treatable stage. These are discussed in the following sections of this document.

Acquired gene mutations

Most DNA mutations related to breast cancer occur in single breast cells during a woman's life rather than having been inherited. These *acquired* mutations of oncogenes and/or tumor suppressor genes may result from other factors, like radiation or cancer-causing chemicals. But so far, the causes of most acquired mutations that could lead to breast cancer remain unknown. Most breast cancers have several gene mutations that are acquired.

Tests to spot acquired gene changes may help doctors more accurately predict the outlook for some women with breast cancer. For example, tests can identify women whose breast cancer cells have too many copies of the HER2 oncogene. These cancers tend to be more aggressive. At the same time, drugs have been developed that specifically target these cancers.

Can breast cancer be prevented?

There is no sure way to prevent breast cancer. But there are things all women can do that might reduce their risk and help increase the odds that if cancer does occur, it is found at an early, more treatable stage.

Lowering your risk

You can lower your risk of breast cancer by changing those risk factors that can be changed (see the section, "What are the risk factors for breast cancer?"). Women who limit alcohol intake, exercise regularly, and maintain a healthy body weight have a lower risk of getting breast cancer. Women who choose to breast-feed for at least several months may also get an added benefit of reducing their breast cancer risk.

Not using hormone therapy after menopause can help you avoid raising your risk.

It’s not clear at this time if environmental chemicals that have estrogen-like properties (like those found in some plastic bottles or certain cosmetics and personal care products) increase breast cancer risk. If there is an increased risk, it is likely to be very small. Still,

women who are concerned may choose to avoid products that contain these substances when possible.

Finding breast cancer early

Other than lifestyle changes, the most important action a woman can take is to follow early detection guidelines. Following the American Cancer Society's guidelines for early detection (outlined in the section, "Can breast cancer be found early?") will not prevent breast cancer, but it can help find cancers when the likelihood of successful treatment is greatest.

For women who are or may be at increased risk

If you are a woman at increased risk for breast cancer (for example, because you have a strong family history of breast cancer, a known genetic mutation of a BRCA gene, or you have had DCIS, LCIS, or biopsies that have shown pre-cancerous changes), there may be some things you can do to reduce your chances of developing breast cancer. Before deciding which, if any, of these may be right for you, talk with your doctor to understand what your risk is and how much any of these approaches might lower this risk.

Genetic testing for BRCA gene mutations

Many women may have relatives with breast cancer, but in most cases this is not the result of BRCA gene mutations. Genetic testing for these mutations can be expensive and the results are often not clear cut. Testing can have a wide range of consequences that need to be considered. It should only be done when there is a reasonable suspicion that a mutation may be present.

The U.S. Preventive Services Task Force (USPSTF) recommends that only women with a strong family history be evaluated for genetic testing for BRCA mutations. This group represents only about 2% of adult women in the United States.

The USPSTF recommends that women who are not of Ashkenazi (Eastern European) Jewish heritage should be referred for genetic evaluation if they have any of the following:

- 2 first-degree relatives (mother, sisters, daughters) with breast cancer, one of whom was diagnosed when they were younger than 50
- 3 or more first- or second-degree relatives (includes grandmothers, aunts) diagnosed with breast cancer
- Both breast and ovarian cancer among first- and second-degree relatives
- A first-degree relative diagnosed with cancer in both breasts
- 2 or more first- or second-degree relatives diagnosed with ovarian cancer
- A male relative with breast cancer

Women of Ashkenazi (Eastern European) Jewish heritage should be referred for genetic evaluation if they have:

- A first-degree relative with breast or ovarian cancer
- 2 second-degree relatives on the same side of the family with breast or ovarian cancer

If you are considering genetic testing, it is strongly recommended that you talk first to a genetic counselor, nurse, or doctor qualified to explain and interpret the results of these tests. It is very important to understand what genetic testing can and can't tell you, and to carefully weigh the benefits and risks of testing before these tests are done. Testing is expensive and may not be covered by some health insurance plans.

For more information, see our document, *Genetic Testing: What You Need to Know*. You may also want to visit the National Cancer Institute web site (www.cancer.gov/cancertopics/Genetic-Testing-for-Breast-and-Ovarian-Cancer-Risk).

Breast cancer chemoprevention

Chemoprevention is the use of drugs to reduce the risk of cancer. Several drugs have been studied for use in lowering breast cancer risk.

Tamoxifen: Tamoxifen is a drug that blocks some of the effects of estrogen on breast tissue. It has been used for many years to reduce the risk of recurrence in localized breast cancer and as a treatment for advanced breast cancer when the tumor is estrogen-receptor positive (see the section, "How is breast cancer treated?"). Several studies have found that tamoxifen can also lower the risk of getting breast cancer in women who are at increased risk for the disease.

Results from the Breast Cancer Prevention Trial (BCPT) have shown that women at increased risk for breast cancer are less likely to develop the disease if they take tamoxifen. Women in the study took either tamoxifen or a placebo pill for 5 years. After 7 years of follow-up, women taking tamoxifen had 42% fewer breast cancers than women who took the placebo, although there was no difference in the risk of dying from breast cancer. Tamoxifen is approved for reducing breast cancer risk in women at high risk.

Tamoxifen has side effects that include increased risks of endometrial (uterine) cancer and blood clotting, so women should consider the possible benefits and risks of tamoxifen before deciding if it is right for them.

And while tamoxifen seems to reduce breast cancer risk in women with BRCA2 gene mutations, the same may not be true for those with BRCA1 mutations.

Raloxifene: Like tamoxifen, raloxifene also blocks the effect of estrogen on breast tissue. A study comparing the effectiveness of the 2 drugs in women after menopause, called the Study of Tamoxifen and Raloxifene (STAR) trial, found that raloxifene worked nearly as well as tamoxifen in reducing the risk of invasive breast cancer and non-invasive cancer (DCIS or LCIS). Raloxifene also had lower risks of certain side effects such as uterine cancer and blood clots in the legs or lungs, compared to tamoxifen (although the risk of blood clots was still higher than normal).

Raloxifene is approved to help reduce breast cancer risk in women past menopause who have osteoporosis (bone thinning) or are at high risk for breast cancer.

Aromatase inhibitors: Drugs such as anastrozole, letrozole, and exemestane are also being studied as breast cancer chemopreventive agents in post-menopausal women. These drugs are already being used to help prevent breast cancer recurrences. They work by blocking the production of small amounts of estrogen that post-menopausal women normally make. But they can also have side effects, such as causing joint pain and stiffness and bone loss, leading to a higher risk of osteoporosis. None of these drugs is approved for reducing the risk of developing breast cancer at this time.

Other drugs: Studies are looking at other drugs as well. For example, some studies have found that women who take aspirin or non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen seem to have a lower risk of breast cancer. Studies are also looking to see if drugs called bisphosphonates may lower the risk of breast cancer. Bisphosphonates are drugs that are mainly used to treat osteoporosis, but they are also used to treat breast cancer that has spread to the bone. These, as well as several other drugs and dietary supplements, are being studied to see if they can lower breast cancer risk, but none is approved for reducing breast cancer risk at this time.

Many of the drugs mentioned here are discussed further in the section, "How is breast cancer treated?" For more information on the possible benefits and risks of chemopreventive drugs see our document, *Medicines to Reduce Breast Cancer Risk*.

Preventive surgery for women with very high breast cancer risk

For the few women who have a very high risk for breast cancer, surgery to remove the breasts or ovaries may be an option.

Preventive (prophylactic) mastectomy: Removing both breasts before cancer is diagnosed can greatly reduce the risk of breast cancer (by up to 97%). Some women diagnosed with cancer in one breast choose to have the other, healthy breast removed as well to prevent a second breast cancer. Breast removal does not completely prevent breast cancer because even a very careful surgeon will leave behind at least a few breast cells. The cells can go on to become cancerous. Some of the reasons for considering this type of surgery may include:

- Mutated BRCA genes found by genetic testing
- Previous cancer in one breast
- Strong family history (breast cancer in several close relatives)
- Lobular carcinoma in situ (LCIS) seen on biopsy

There is no way to know ahead of time whether this surgery will benefit a particular woman. Some women with BRCA mutations will develop breast cancer early in life, and have a very high risk of getting a second breast cancer. Prophylactic mastectomy before the cancer occurs might add many years to their lives. But while most women with

BRCA mutations develop breast cancer, some don't. These women would not benefit from the surgery, but they would still have to deal with its after- effects.

Second opinions are strongly recommended before any woman decides to have this surgery. The American Cancer Society Board of Directors has stated that "only very strong clinical and/or pathologic indications warrant doing this type of preventive operation." Nonetheless, after careful consideration, this might be the right choice for some women.

Prophylactic oophorectomy (ovary removal): Women with a BRCA mutation may reduce their risk of breast cancer by 50% or more by having their ovaries surgically removed before menopause. This is because the surgery removes the main sources of estrogen in the body (the ovaries).

This document is not about ovarian cancer, but it is important that women with a BRCA mutation recognize they also have a high risk of developing ovarian cancer. Most doctors recommend that women with BRCA mutations have their ovaries surgically removed once they finish having children to lower this risk.

Can breast cancer be found early?

Screening refers to tests and exams used to find a disease, like cancer, in people who do not have any symptoms. The goal of screening exams, such as mammograms, is to find cancers before they start to cause symptoms. Breast cancers that are found because they can be felt tend to be larger and are more likely to have already spread beyond the breast. In contrast, breast cancers found during screening exams are more likely to be small and still confined to the breast. The size of a breast cancer and how far it has spread are important factors in predicting the prognosis (outlook) for a woman with this disease.

Most doctors feel that early detection tests for breast cancer save many thousands of lives each year, and that many more lives could be saved if even more women and their health care providers took advantage of these tests. Following the American Cancer Society's guidelines for the early detection of breast cancer improves the chances that breast cancer can be diagnosed at an early stage and treated successfully.

American Cancer Society recommendations for early breast cancer detection

Women age 40 and older should have a screening mammogram every year and should continue to do so for as long as they are in good health.

- Current evidence supporting mammograms is even stronger than in the past. In particular, recent evidence has confirmed that mammograms offer substantial benefit for women in their 40s. Women can feel confident about the benefits associated with regular mammograms for finding cancer early. However, mammograms also have

limitations. A mammogram will miss some cancers, and it sometimes leads to follow up of findings that are not cancer, including biopsies.

- Women should be told about the benefits, limitations, and potential harms linked with regular screening. Mammograms can miss some cancers. But despite their limitations, they remain a very effective and valuable tool for decreasing suffering and death from breast cancer.

- Mammograms for older women should be based on the individual, her health, and other serious illnesses, such as congestive heart failure, end-stage renal disease, chronic obstructive pulmonary disease, and moderate-to-severe dementia. Age alone should not be the reason to stop having regular mammograms. As long as a woman is in good health and would be a candidate for treatment, she should continue to be screened with a mammogram.

Women in their 20s and 30s should have a clinical breast exam (CBE) as part of a periodic (regular) health exam by a health professional, at least every 3 years. After age 40, women should have a breast exam by a health professional every year.

- CBE is a complement to mammograms and an opportunity for women and their doctor or nurse to discuss changes in their breasts, early detection testing, and factors in the woman's history that might make her more likely to have breast cancer.

- There may be some benefit in having the CBE shortly before the mammogram. The exam should include instruction for the purpose of getting more familiar with your own breasts. Women should also be given information about the benefits and limitations of CBE and breast self exam (BSE). Breast cancer risk is very low for women in their 20s and gradually increases with age. Women should be told to promptly report any new breast symptoms to a health professional.

Breast self exam (BSE) is an option for women starting in their 20s. Women should be told about the benefits and limitations of BSE. Women should report any breast changes to their health professional right away.

- Research has shown that BSE plays a small role in finding breast cancer compared with finding a breast lump by chance or simply being aware of what is normal for each woman. Some women feel very comfortable doing BSE regularly (usually monthly after their period) which involves a systematic step-by-step approach to examining the look and feel of their breasts. Other women are more comfortable simply looking and feeling their breasts in a less systematic approach, such as while showering or getting dressed or doing an occasional thorough exam. Sometimes, women are so concerned about "doing it right" that they become stressed over the technique. Doing BSE regularly is one way for women to know how their breasts normally look and feel and to notice any changes. The goal, with or without BSE, is to report any breast changes to a doctor or nurse right away.

- Women who choose to do BSE should have their BSE technique reviewed during their physical exam by a health professional. It is okay for women to choose not to do BSE or not to do it on a regular schedule. However, by doing the exam regularly, you get to know how your breasts normally look and feel and you can more readily detect

any signs or symptoms if a change occurs, such as development of a lump or swelling, skin irritation or dimpling, nipple pain or retraction (turning inward), redness or scaliness of the nipple or breast skin, or a discharge other than breast milk. Should you notice any changes you should see your health care provider as soon as possible for evaluation. Remember that most of the time, however, these breast changes are not cancer.

Women at high risk (greater than 20% lifetime risk) should get an MRI and a mammogram every year. Women at moderately increased risk (15% to 20% lifetime risk) should talk with their doctors about the benefits and limitations of adding MRI screening to their yearly mammogram. Yearly MRI screening is not recommended for women whose lifetime risk of breast cancer is less than 15%.

Women at high risk include those who:

- Have a known BRCA1 or BRCA2 gene mutation
- Have a first-degree relative (parent, brother, sister, or child) with a BRCA1 or BRCA2 gene mutation, but have not had genetic testing themselves
- Have a lifetime risk of breast cancer of 20% to 25% or greater, according to risk assessment tools that are based mainly on family history (such as the Claus model - see below)
- Had radiation therapy to the chest when they were between the ages of 10 and 30 years
- Have Li-Fraumeni syndrome, Cowden syndrome, or hereditary diffuse gastric cancer, or have first-degree relatives with one of these syndromes

Women at moderately increased risk include those who:

- Have a lifetime risk of breast cancer of 15% to 20%, according to risk assessment tools that are based mainly on family history (see below)
- Have a personal history of breast cancer, ductal carcinoma in situ (DCIS), lobular carcinoma in situ (LCIS), atypical ductal hyperplasia (ADH), or atypical lobular hyperplasia (ALH)
- Have extremely dense breasts or unevenly dense breasts when viewed by mammograms

If MRI is used, it should be in addition to, not instead of, a screening mammogram. This is because while an MRI is a more sensitive test (it's more likely to detect cancer than a mammogram), it may still miss some cancers that a mammogram would detect.

For most women at high risk, screening with MRI and mammograms should begin at age 30 years and continue for as long as a woman is in good health. But because the evidence is limited regarding the best age at which to start screening, this decision should be based on shared decision making between patients and their health care providers, taking into account personal circumstances and preferences.

Several risk assessment tools, with names like the Gail model, the Claus model, and the Tyrer-Cuzick model, are available to help health professionals estimate a woman's breast cancer risk. These tools give approximate, rather than precise, estimates of breast cancer risk based on different combinations of risk factors and different data sets. As a result, they may give different risk estimates for the same woman. For example, the Gail model bases its risk estimates on certain personal risk factors, like age at menarche (first menstrual period) and history of prior breast biopsies, along with any history of breast cancer in first-degree relatives. The Claus model estimates risk based on family history of breast cancer in both first and second-degree relatives. These 2 models could easily give different estimates using the same data. Results obtained from any of the risk assessment tools should be discussed by a woman and her doctor when being used to decide whether to start MRI screening.

It is recommended that women who get screening MRI do so at a facility that can do an MRI-guided breast biopsy at the same time if needed. Otherwise, the woman will have to have a second MRI exam at another facility at the time of biopsy.

There is no evidence right now that MRI will be an effective screening tool for women at average risk. MRI is more sensitive than mammograms, but it also has a higher false-positive rate (it is more likely to find something that turns out not to be cancer). This would lead to unneeded biopsies and other tests in many of these women.

The American Cancer Society believes the use of mammograms, MRI (in women at high risk), clinical breast exams, and finding and reporting breast changes early, according to the recommendations outlined above, offers women the best chance to reduce their risk of dying from breast cancer. This combined approach is clearly better than any one exam or test alone. Without question, breast physical exam without a mammogram would miss the opportunity to detect many breast cancers that are too small for a woman or her doctor to feel but can be seen on mammograms. Although mammograms are a sensitive screening method, a small percentage of breast cancers do not show up on mammograms but can be felt by a woman or her doctors. For women at high risk of breast cancer, like those with BRCA gene mutations or a strong family history, both MRI and mammogram exams of the breast are recommended.

Mammograms

A mammogram is an x-ray of the breast. A diagnostic mammogram is used to diagnose breast disease in women who have breast symptoms or an abnormal result on a screening mammogram. Screening mammograms are used to look for breast disease in women who are asymptomatic; that is, they appear to have no breast problems. Screening mammograms usually take 2 views (x-ray pictures taken from different angles) of each breast. For some patients, such as women with breast implants, more pictures may be needed to include as much breast tissue as possible. Women who are breast-feeding can still get mammograms, but these are probably not quite as accurate because the breast tissue tends to be dense.

Breast x-rays have been done for more than 70 years, but the modern mammogram has only existed since 1969. That was the first year x-ray units specifically for breast imaging

were available. Modern mammogram equipment designed for breast x-rays uses very low levels of radiation, usually a dose of about 0.1 to 0.2 rads per picture (a rad is a measure of radiation dose).

Strict guidelines ensure that mammogram equipment is safe and uses the lowest dose of radiation possible. Many people are concerned about the exposure to x-rays, but the level of radiation used in modern mammograms does not significantly increase the risk for breast cancer.

To put dose into perspective, if a woman with breast cancer is treated with radiation, she will receive around 5,000 rads. If she had yearly mammograms beginning at age 40 and continuing until she was 90, she will have received 20 to 40 rads.

For a mammogram, the breast is pressed between 2 plates to flatten and spread the tissue. This may be uncomfortable for a moment, but it is necessary to produce a good, readable mammogram. The compression only lasts a few seconds. The entire procedure for a screening mammogram takes about 20 minutes. This procedure produces a black and white image of the breast tissue either on a large sheet of film or as a digital computer image that is read, or interpreted, by a radiologist (a doctor trained to interpret images from x-rays, ultrasound, MRI, and related tests).

Some advances in technology, like digital mammography, may help doctors read mammograms more accurately. They are described in the section, "How is breast cancer diagnosed?"

What the doctor looks for on your mammogram

The doctor reading the films will look for several types of changes:

Calcifications are tiny mineral deposits within the breast tissue, which look like small white spots on the films. They may or may not be caused by cancer. There are 2 types of calcifications:

- Macrocalcifications are coarse (larger) calcium deposits that are most likely changes in the breasts caused by aging of the breast arteries, old injuries, or inflammation. These deposits are related to non-cancerous conditions and do not require a biopsy. Macrocalcifications are found in about half the women over 50, and in about 1 of 10 women under 50.

- Microcalcifications are tiny specks of calcium in the breast. They may appear alone or in clusters. Microcalcifications seen on a mammogram are of more concern, but still usually do not mean that cancer is present. The shape and layout of microcalcifications help the radiologist judge how likely it is that cancer is present. If the calcifications look suspicious for cancer, a biopsy will be done.

A *mass*, which may occur with or without calcifications, is another important change seen on mammograms. Masses can be many things, including cysts (non-cancerous, fluid-filled sacs) and non-cancerous solid tumors (such as fibroadenomas), but they could also be cancer. Masses that are not cysts usually need to be biopsied.

- A cyst and a tumor can feel alike on a physical exam. They can also look the same on a mammogram. To confirm that a mass is really a cyst, a breast ultrasound is often done. Another option is to remove (aspirate) the fluid from the cyst with a thin, hollow needle.

- If a mass is not a simple cyst (that is, if it is at least partly solid), then you may need to have more imaging tests. Some masses can be watched with periodic mammograms, while others may need a biopsy. The size, shape, and margins (edges) of the mass help the radiologist determine if cancer is present.

Having your previous mammograms available for the radiologist is very important. They can be helpful to show that a mass or calcification has not changed for many years. This would mean that it is probably a benign condition and a biopsy is not needed.

Limitations of mammograms

A mammogram cannot prove that an abnormal area is cancer. To confirm whether cancer is present, a small amount of tissue must be removed and looked at under a microscope. This procedure, called a *biopsy*, is described in the section, "How is breast cancer diagnosed?"

You should also be aware that mammograms are done to find breast cancer that cannot be felt. If you have a breast lump, you should have it checked by your doctor and consider having it biopsied even if your mammogram result is normal.

For some women, such as those with breast implants, additional pictures may be needed. Breast implants make it harder to see breast tissue on standard mammograms, but additional x-ray pictures with implant displacement and compression views can be used to more completely examine the breast tissue.

Mammograms are not perfect at finding breast cancer. They do not work as well in younger women, usually because their breasts are dense, and can hide a tumor. This may also be true for pregnant women and women who are breast-feeding. Since most breast cancers occur in older women, this is usually not a major concern.

However, this can be a problem for young women who are at high risk for breast cancer (due to gene mutations, a strong family history of breast cancer, or other factors) because they often develop breast cancer at a younger age. For this reason, the American Cancer Society now recommends MRI scans in addition to mammograms for screening in these women. (MRI scans are described below.)

For more information on these tests, also see the section, "How is breast cancer diagnosed?" and our document, *Mammograms and Other Breast Imaging Procedures*.

What to expect when you have a mammogram

- To have a mammogram you must undress above the waist. The facility will give you a wrap to wear.

- A technologist will be there to position your breasts for the mammogram. Most technologists are women. You and the technologist are the only ones in the room during the mammogram.
- To get a high-quality mammogram picture with excellent image quality, it is necessary to flatten the breast slightly. The technologist places the breast on the mammogram machine's lower plate, which is made of metal and has a drawer to hold the x-ray film or the camera to produce a digital image. The upper plate, made of plastic, is lowered to compress the breast for a few seconds while the technician takes a picture.
- The whole procedure takes about 20 minutes. The actual breast compression only lasts a few seconds.
- You will feel some discomfort when your breasts are compressed, and for some women compression can be painful. Try not to schedule a mammogram when your breasts are likely to be tender, as they may be just before or during your period.
- All mammogram facilities are now required to send your results to you within 30 days. Generally, you will be contacted within 5 working days if there is a problem with the mammogram.
- Only 2 to 4 mammograms of every 1,000 lead to a diagnosis of cancer. About 10% of women who have a mammogram will require more tests, and the majority will only need an additional mammogram. Don't panic if this happens to you. Only 8% to 10% of those women will need a biopsy, and most (80%) of those biopsies will not be cancer.

If you are a woman aged 40 or over, you should get a mammogram every year. You can schedule the next one while you're at the facility and/or request a reminder.

Tips for having a mammogram

The following are useful suggestions for making sure that you will receive a quality mammogram:

- If it is not posted visibly near the receptionist's desk, ask to see the FDA certificate that is issued to all facilities that offer mammography. The FDA requires that all facilities meet high professional standards of safety and quality in order to be a provider of mammography services. A facility may not provide mammography without certification.
- Use a facility that either specializes in mammography or does many mammograms a day.
- If you are satisfied that the facility is of high quality, continue to go there on a regular basis so that your mammograms can be compared from year to year.
- If you are going to a facility for the first time, bring a list of the places, dates of mammograms, biopsies, or other breast treatments you have had before.

- If you have had mammograms at another facility, you should make every attempt to get those mammograms to bring with you to the new facility (or have them sent there) so that they can be compared to the new ones.
- On the day of the exam don't wear deodorant or antiperspirant. Some of these contain substances that can interfere with the reading of the mammogram by appearing on the x-ray film as white spots.
- You may find it easier to wear a skirt or pants, so that you'll only need to remove your blouse for the exam.
- Schedule your mammogram when your breasts are not tender or swollen to help reduce discomfort and to ensure a good picture. Try to avoid the week just before your period.
- Always describe any breast symptoms or problems that you are having to the technologist who is doing the mammogram. Be prepared to describe any medical history that could affect your breast cancer risk -- such as surgery, hormone use, or family or personal history of breast cancer. Discuss any new findings or problems in your breasts with your doctor or nurse before having a mammogram.
- If you do not hear from your doctor within 10 days, do not assume that your mammogram was normal -- call your doctor or the facility.

Help with mammogram costs

Medicare, Medicaid, and most private health insurance plans cover mammogram costs or a percentage of them. Low-cost mammograms are available in most communities. Call us at 1-800-227-2345 for information about facilities in your area.

Breast cancer screening is now more available to medically underserved women through the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). This program provides breast and cervical cancer early detection testing to women without health insurance for free or at very low cost. Although the program is administered within each state, the Centers for Disease Control and Prevention (CDC) provide matching funds and support to each state program. Each state's Department of Health has information on how to contact the nearest program.

The program is only designed to provide screening. But if a cancer is discovered, it will cover further diagnostic testing and a surgical consultation.

The Breast and Cervical Cancer Prevention and Treatment Act gives states Medicaid funds to pay for treating breast and cervical cancers that are detected through the NBCCEDP. This helps women focus their energies on fighting their disease, instead of worrying about how to pay for treatment. All states participate in this program.

To learn more about these programs, please contact the CDC at 1-800-CDC INFO (1-800-232-4636) or online at www.cdc.gov/cancer/nbccedp.

Clinical breast exam

A clinical breast exam (CBE) is an exam of your breasts by a health care professional, such as a doctor, nurse practitioner, nurse, or doctor's assistant. For this exam, you undress from the waist up. The health care professional will first look at your breasts for abnormalities in size or shape, or changes in the skin of the breasts or nipple. Then, using the pads of the fingers, the examiner will gently feel (palpate) your breasts.

Special attention will be given to the shape and texture of the breasts, location of any lumps, and whether such lumps are attached to the skin or to deeper tissues. The area under both arms will also be examined.

The CBE is a good time for women who don't know how to examine their breasts to learn the proper technique from their health care professionals. Ask your doctor or nurse to teach you and watch your technique.

Breast awareness and self exam

Beginning in their 20s, women should be told about the benefits and limitations of breast self-exam (BSE). Women should know how their breasts normally look and feel and report any new breast changes to a health professional as soon as they are found. Finding a breast change does not necessarily mean there is a cancer.

A woman can notice changes by being aware of how her breasts normally look and feel and by feeling her breasts for changes (breast awareness), or by choosing to use a step-by-step approach (see below) and using a specific schedule to examine her breasts.

If you choose to do BSE, the information below is a step-by-step approach for the exam. The best time for a woman to examine her breasts is when the breasts are not tender or swollen. Women who examine their breasts should have their technique reviewed during their periodic health exams by their health care professional.

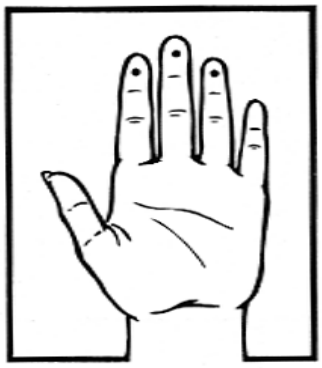
Women with breast implants can do BSE, too. It may be helpful to have the surgeon help identify the edges of the implant so that you know what you are feeling. There is some thought that the implants push out the breast tissue and may actually make it easier to examine. Women who are pregnant or breast-feeding can also choose to examine their breasts regularly.

It is acceptable for women to choose not to do BSE or to do BSE once in a while. Women who choose not to do BSE should still be aware of the normal look and feel of their breasts and report any changes to their doctor right away.

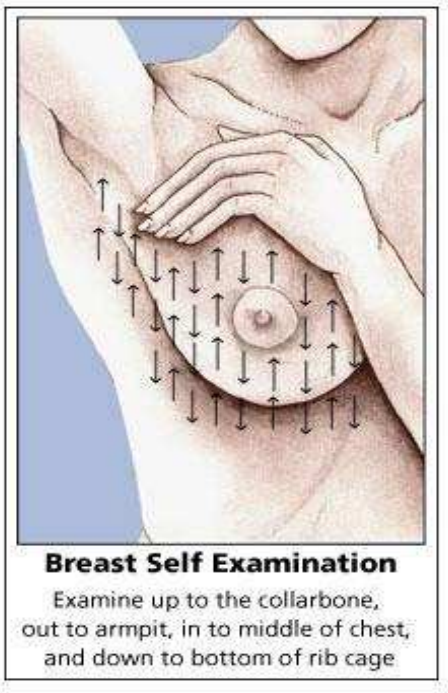
How to examine your breasts

- Lie down and place your right arm behind your head. The exam is done while lying down, not standing up. This is because when lying down the breast tissue spreads evenly over the chest wall and is as thin as possible, making it much easier to feel all the breast tissue.

- Use the finger pads of the 3 middle fingers on your left hand to feel for lumps in the right breast. Use overlapping dime-sized circular motions of the finger pads to feel the breast tissue.



- Use 3 different levels of pressure to feel all the breast tissue. Light pressure is needed to feel the tissue closest to the skin; medium pressure to feel a little deeper; and firm pressure to feel the tissue closest to the chest and ribs. It is normal to feel a firm ridge in the lower curve of each breast, but you should tell your doctor if you feel anything else out of the ordinary. If you're not sure how hard to press, talk with your doctor or nurse. Use each pressure level to feel the breast tissue before moving on to the next spot.
- Move around the breast in an up and down pattern starting at an imaginary line drawn straight down your side from the underarm and moving across the breast to the middle of the chest bone (sternum or breastbone). Be sure to check the entire breast area going down until you feel only ribs and up to the neck or collar bone (clavicle).



- There is some evidence to suggest that the up-and-down pattern (sometimes called the vertical pattern) is the most effective pattern for covering the entire breast, without missing any breast tissue.
- Repeat the exam on your left breast, putting your left arm behind your head and using the finger pads of your right hand to do the exam.
- While standing in front of a mirror with your hands pressing firmly down on your hips, look at your breasts for any changes of size, shape, contour, or dimpling, or redness or scaliness of the nipple or breast skin. (The pressing down on the hips position contracts the chest wall muscles and enhances any breast changes.)
- Examine each underarm while sitting up or standing and with your arm only slightly raised so you can easily feel in this area. Raising your arm straight up tightens the tissue in this area and makes it harder to examine.

This procedure for doing breast self exam is different from previous recommendations. These changes represent an extensive review of the medical literature and input from an expert advisory group. There is evidence that this position (lying down), the area felt, pattern of coverage of the breast, and use of different amounts of pressure increase a woman's ability to find abnormal areas.

Magnetic resonance imaging (MRI)

For certain women at high risk for breast cancer, screening MRI is recommended along with a yearly mammogram. It is not generally recommended as a screening tool by itself, because although it is a sensitive test, it may still miss some cancers that mammograms would detect.

MRI scans use magnets and radio waves (instead of x-rays) to produce very detailed, cross-sectional images of the body. The most useful MRI exams for breast imaging use a contrast material (gadolinium) that is injected into a vein in the arm before or during the exam. This improves the ability of the MRI to clearly show breast tissue details. (For more details on how an MRI test is done, see the section, " How is breast cancer diagnosed?")

MRI is more sensitive in detecting cancers than mammograms, but it also has a higher false-positive rate (where the test finds something that turns out not to be cancer), which results in more recalls and biopsies. This is why it is not recommended as a screening test for women at average risk of breast cancer, as it would result in unneeded biopsies and other tests in a large portion of these women.

Just as mammography uses x-ray machines that are specially designed to image the breasts, breast MRI also requires special equipment. Breast MRI machines produce higher quality images than MRI machines designed for head, chest, or abdominal scanning. However, many hospitals and imaging centers do not have dedicated breast MRI equipment available. It is important that screening MRIs be done at facilities that can perform an MRI-guided breast biopsy. Otherwise, the entire scan will need to be repeated at another facility when the biopsy is done.

MRI is more expensive than mammography. Most major insurance companies will likely pay for these screening tests if a woman can be shown to be at high risk, but it's not yet clear if all companies will do so. At this time there are concerns about costs of and limited access to high-quality MRI breast screening services for women at high risk of breast cancer.

How is breast cancer diagnosed?

Breast cancer is sometimes found after symptoms appear, but many women with early breast cancer have no symptoms. This is why getting the recommended screening tests (as described in the section, "Can breast cancer be found early?") before any symptoms develop is so important.

If something suspicious is found during a screening exam, or if you have any of the symptoms of breast cancer described below, your doctor will use one or more methods to find out if the disease is present. If cancer is found, other tests will be done to determine the stage (extent) of the cancer.

Signs and symptoms

Widespread use of screening mammograms has increased the number of breast cancers found before they cause any symptoms, but some breast cancers are not found by mammogram, either because the test was not done or because, even under ideal conditions, mammograms do not find every breast cancer.

The most common sign of breast cancer is a new lump or mass. A painless, hard mass that has irregular edges is more likely to be cancerous, but breast cancers can be tender,

soft, or rounded. For this reason, it is important that any new breast mass or lump be checked by a health care professional experienced in diagnosing breast diseases.

Other possible signs of breast cancer include:

- Swelling of all or part of a breast (even if no distinct lump is felt)
- Skin irritation or dimpling
- Breast or nipple pain
- Nipple retraction (turning inward)
- Redness, scaliness, or thickening of the nipple or breast skin
- Nipple discharge (other than breast milk)

Sometimes a breast cancer can spread to underarm lymph nodes and cause a lump or swelling there, even before the original tumor in the breast tissue is large enough to be felt.

Medical history and physical exam

If you have any signs or symptoms that might be due to breast cancer, be sure to see your doctor as soon as possible. Your doctor will ask you questions about your symptoms, any other health problems, and possible risk factors for benign breast conditions or breast cancer.

Your breasts will be thoroughly examined for any lumps or suspicious areas and to feel their texture, size, and relationship to the skin and chest muscles. Any changes in the nipples or the skin of your breasts will be noted. The lymph nodes in the armpit and above the collarbones may be palpated (felt), because enlargement or firmness of these lymph nodes might indicate spread of breast cancer. Your doctor may also probably do a complete physical exam to judge your general health and whether there is any evidence of cancer that may have spread.

If breast symptoms and/or the results of your physical exam suggest breast cancer might be present, more tests will likely be done. These might include imaging tests, looking at samples of nipple discharge, or doing biopsies of suspicious areas.

Imaging tests used to evaluate breast disease

Imaging tests use x-rays, magnetic fields, sound waves, or radioactive substances to create pictures of the inside of your body. Imaging tests may be done for a number of reasons, including to help find out whether a suspicious area might be cancerous, to learn how far cancer may have spread, and to help determine if treatment is working.

Diagnostic mammograms

Mammograms are mostly used for screening, but they can also be used to examine the breast of a woman who has a breast problem. This can be a breast mass, nipple discharge, or an abnormality that was found on a screening mammogram. In some cases, special images known as *cone views with magnification* are used to make a small area of abnormal breast tissue easier to evaluate.

A diagnostic mammogram can show:

- That the abnormality is not worrisome at all. In these cases the woman can usually return to having routine yearly mammograms.
- That a lesion (area of abnormal tissue) has a high likelihood of being benign (not cancer). In these cases, it is common to ask the woman to come back sooner than usual for her next mammogram, usually in 4 to 6 months.
- That the lesion is more suspicious, and a biopsy is needed to tell if it is cancer.

Even if the mammograms show no tumor, if you or your doctor can feel a lump, a biopsy is usually needed to make sure it isn't cancer. One exception would be if an ultrasound exam finds that the lump is a simple cyst (a fluid-filled sac), which is very unlikely to be cancerous.

Digital mammograms: A digital mammogram (also known as a *full-field digital mammogram,* or *FFDM*) is like a standard mammogram in that x-rays are used to produce an image of your breast. The differences are in the way the image is recorded, viewed by the doctor, and stored. Standard mammograms are recorded on large sheets of photographic film. Digital mammograms are recorded and stored on a computer. After the exam, the doctor can look at them on a computer screen and adjust the image size, brightness, or contrast to see certain areas more clearly. Digital images can also be sent electronically to another site for a remote consult with breast specialists. Many centers do not offer the digital option, but it is becoming more widely available with time.

Because digital mammograms cost more than standard mammograms, studies are now looking at which form of mammogram will benefit more women in the long run. Some studies have found that women who have a FFDM have to return less often for additional imaging tests because of inconclusive areas on the original mammogram. A recent large study found that a FFDM was more accurate in finding cancers in women younger than 50 and in women with dense breast tissue, although the rates of inconclusive results were similar between FFDM and film mammograms. It is important to remember that a standard film mammogram also is effective for these groups of women, and that they should not miss their regular mammogram if a digital mammogram is not available.

Computer-aided detection and diagnosis (CAD): Over the past 2 decades, computer-aided detection and diagnosis (CAD) has been developed to help radiologists detect suspicious changes on mammograms. This can be done with standard film mammograms or with digital mammograms.

Computers can help doctors identify abnormal areas on a mammogram by acting as a second set of eyes. For standard mammograms, the film is fed into a machine which converts the image into a digital signal that is then analyzed by the computer. Alternatively, the technology can be applied to a digital mammogram. The computer then displays the image on a video screen, with markers pointing to areas that the radiologist should check especially closely.

It's not yet clear how useful CAD is. Some doctors find it helpful, but a recent, large study found it did not significantly improve the accuracy of breast cancer detection. It did, however, increase the number of women who needed to have breast biopsies. Further research is needed.

Magnetic resonance imaging (MRI) of the breast

MRI scans use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. A contrast liquid called gadolinium is often injected into a vein before or during the scan to show details better.

MRI scans can take a long time -- often up to an hour. You have to lie inside a narrow tube, which is confining and may upset people with claustrophobia (a fear of enclosed spaces). The machine also makes loud buzzing and clicking noises that you may find disturbing. Some places will give you headphones with music to block this out. MRIs are also expensive, although insurance plans generally pay for them in some situations, such as once cancer is diagnosed.

MRI machines are quite common, but they need to be specially adapted to look at the breast. It's important that MRI scans of the breast be done on one of these specially adapted machines.

MRI can be used along with mammograms for screening women who have a high risk of developing breast cancer, or it can be used to better examine suspicious areas found by a mammogram. MRI is also used for women who have been diagnosed with breast cancer to better determine the actual size of the cancer and to look for any other cancers in the breast.

If an abnormal area in the breast is found, it can often be biopsied using an MRI for guidance. This is discussed in more detail in the "Biopsy" section.

Breast ultrasound

Ultrasound, also known as *sonography*, uses sound waves to outline a part of the body. For this test, a small, microphone-like instrument called a transducer is placed on the skin (which is often first lubricated with ultrasound gel). It emits sound waves and picks up the echoes as they bounce off body tissues. The echoes are converted by a computer into a black and white image that is displayed on a computer screen. This test is painless and does not expose you to radiation.

Ultrasound has become a valuable tool to use along with mammography because it is widely available and less expensive than other options, such as MRI. The use of ultrasound instead of mammograms for breast cancer screening is not recommended. Usually, breast ultrasound is used to target a specific area of concern found on the mammogram. Ultrasound helps distinguish between cysts (fluid-filled sacs) and solid masses and sometimes can help tell the difference between benign and cancerous tumors.

Ultrasound may be most helpful in women with very dense breasts. Clinical trials are now looking at the benefits and risks of adding breast ultrasound to screening mammograms in women with dense breasts and a higher risk of breast cancer.

Ductogram

This test, also called a *galactogram*, sometimes helps determine the cause of nipple discharge. In this test a very thin plastic tube is placed into the opening of the duct in the nipple that the discharge is coming from. A small amount of contrast medium is injected, which outlines the shape of the duct on an x-ray image and shows if there is a mass inside the duct.

Newer imaging tests

Newer tests like scintimammography and tomosynthesis are not used commonly and are still being studied to determine their usefulness. They are described in the section, "What's new in breast cancer research and treatment?"

Other tests

These tests may be done for the purposes of research, but they have not yet been found to be helpful in diagnosing breast cancer in most women.

Nipple discharge exam

If you are having nipple discharge, some of the fluid may be collected and looked at under a microscope to see if any cancer cells are in it. Most nipple discharges or secretions are not cancer. In general, if the secretion appears milky or clear green, cancer is very unlikely. If the discharge is red or red-brown, suggesting that it contains blood, it might possibly be caused by cancer, although an injury, infection, or benign tumors are more likely causes.

Even when no cancer cells are found in a nipple discharge, it is not possible to say for certain that a breast cancer is not there. If a patient has a suspicious mass, it will be necessary to biopsy the mass, even if the nipple discharge does not contain cancer cells.

Ductal lavage and nipple aspiration

Ductal lavage is an experimental test developed for women who have no symptoms of breast cancer but are at very high risk for the disease. It is not a test to screen for or

diagnose breast cancer, but it may help give a more accurate picture of a woman's risk of developing it.

Ductal lavage can be done in a doctor's office or an outpatient facility. An anesthetic cream is applied to numb the nipple area. Gentle suction is then used to help draw tiny amounts of fluid from the milk ducts up to the nipple surface, which helps locate the ducts' natural openings. A tiny tube (called a *catheter*) is then inserted into a duct opening. Saline (salt water) is slowly infused into the catheter to gently rinse the duct and collect cells. The ductal fluid is withdrawn through the catheter and sent to a lab, where the cells are looked at under a microscope.

Ductal lavage is not considered appropriate for women who aren't at high risk for breast cancer. It is not clear if it will ever be useful. The test has not been shown to detect cancer early. It is more likely to be helpful as a test of cancer risk rather than as a screening test for cancer. More studies are needed to better define the usefulness of this test.

Nipple aspiration also looks for abnormal cells developing in the ducts, but is much simpler, because nothing is inserted into the breast. The device for nipple aspiration uses small cups that are placed on the woman's breasts. The device warms the breasts, gently compresses them, and applies light suction to bring nipple fluid to the surface of the breast. The nipple fluid is then collected and sent to a lab for analysis. As with ductal lavage, the procedure may be useful as a test of cancer risk but is not appropriate as a screening test for cancer. The test has not been shown to detect cancer early.

Biopsy

During a biopsy, the doctor removes a sample of the suspicious area to be looked at under a microscope. A biopsy is done when mammograms, other imaging tests, or the physical exam finds a breast change (or abnormality) that is possibly cancer. A biopsy is the only way to tell if cancer is really present.

There are several types of biopsies, such as fine needle aspiration biopsy, core (large needle) biopsy, and surgical biopsy. Each has its pros and cons. The choice of which to use depends on your specific situation. Some of the factors your doctor will consider include how suspicious the lesion appears, how large it is, where in the breast it is located, how many lesions are present, other medical problems you may have, and your personal preferences. You might want to discuss the pros and cons of different biopsy types with your doctor.

Fine needle aspiration biopsy

In a fine needle aspiration (FNA) biopsy, the doctor uses a very thin, hollow needle attached to a syringe to withdraw (aspirate) a small amount of tissue from a suspicious area, which is then looked at under a microscope. The needle used for an FNA biopsy is thinner than the ones used for blood tests.

If the area to be biopsied can be felt, the needle can be guided into the area of the breast change while the doctor is feeling (palpating) it.

If the lump can't be felt easily, the doctor might use ultrasound to watch the needle on a screen as it moves toward and into the mass.

A local anesthetic (numbing medicine) may or may not be used. Because such a thin needle is used for the biopsy, the process of getting the anesthetic may actually be more uncomfortable than the biopsy itself.

Once the needle is in place, fluid is drawn out. If the fluid is clear, the lump is probably a benign cyst. Bloody or cloudy fluid can mean either a benign cyst or, very rarely, a cancer. If the lump is solid, small tissue fragments are drawn out. A pathologist will look at the biopsy tissue or fluid under a microscope to determine if it is cancerous.

An FNA biopsy is the easiest type of biopsy to have, but it has some disadvantages. It can sometimes miss a cancer if the needle is not placed among the cancer cells. And even if cancer cells are found, it is usually not possible to determine if the cancer is invasive. In some cases there may not be enough cells to perform some of the other lab tests that are routinely done on breast cancer specimens. If the FNA biopsy does not provide a clear diagnosis, or your doctor is still suspicious, a second biopsy or a different type of biopsy should be done.

Core needle biopsy

A core biopsy uses a larger needle to sample breast changes felt by the doctor or pinpointed by ultrasound or mammogram. (When mammograms taken from different angles are used to pinpoint the biopsy site, this is known as a stereotactic core needle biopsy.) In some centers, the biopsy can be guided by an MRI scan.

The needle used in core biopsies is larger than that used in FNA. It removes a small cylinder (core) of tissue (about 1/16- to 1/8-inch in diameter and ½-inch long) from a breast abnormality. Several cores are often removed. The biopsy is done using local anesthesia (where you are awake but the area is numbed) in an outpatient setting.

Because it removes larger pieces of tissue, a core needle biopsy is more likely than an FNAB to provide a clear diagnosis, although it may still miss some cancers.

Vacuum-assisted biopsies

Vacuum-assisted biopsies can be done with systems such as the Mammotome® or ATEC® (Automated Tissue Excision and Collection). For these procedures the skin is numbed and a small incision (about ¼ inch) is made. A hollow probe is inserted through the incision into the abnormal area of breast tissue. The probe can be guided into place using x-rays or ultrasound (or MRI in the case of the ATEC system). A cylinder of tissue is then suctioned in through a hole in the side the probe, and a rotating knife within the probe cuts the tissue sample from the rest of the breast. Several samples can be taken from the same incision. Vacuum-assisted biopsies are done as an outpatient procedure.

No stitches are needed, and there is minimal scarring. This method usually removes more tissue than core biopsies.

Surgical (open) biopsy

Sometimes, surgery is needed to remove all or part of the lump for microscopic examination. This is referred to as a surgical biopsy or an open biopsy. Usually this is an excisional biopsy, where the surgeon removes the entire mass or abnormal area, as well as a surrounding margin of normal-appearing breast tissue. If the mass is too large to be removed easily, an incisional biopsy may be done instead. In this type of biopsy only part of the mass is removed. In rare cases, this type of biopsy can be done in the doctor's office, but it is more commonly done in the hospital's outpatient department under a local anesthesia (where you are awake, but your breast is numbed). You may also be given medicine to make you drowsy. This type of biopsy can also be done under general anesthesia, (you are asleep).

During a surgical breast biopsy the surgeon may use a procedure called *stereotactic wire localization* if there is a small lump that is hard to locate by touch or if an area looks suspicious on the x-ray but cannot be felt. After the area is numbed with local anesthetic, a thin hollow needle is placed into the breast, and x-ray views are used to guide the needle to the suspicious area. Once the tip of the needle is in the right spot, a thin wire is inserted through the center of the needle. A small hook at the end of the wire keeps it in place. The hollow needle is then removed. The surgeon can then use the wire as a guide to the abnormal area to be removed. The surgical specimen is sent to the lab to be looked at under a microscope (see below).

This type of biopsy is more involved than an FNA biopsy or a core needle biopsy, typically requires several stitches and may leave a scar. Core needle biopsy is usually enough to make a diagnosis, but sometimes an open biopsy may be needed depending on where the lesion is, or if a core biopsy is not conclusive.

Lymph node dissection and sentinel lymph node biopsy

These procedures are done specifically to look for cancer in the lymph nodes. They are described in more detail in the section, "How is breast cancer treated?"

Laboratory examination of breast cancer tissue

The biopsy samples of breast tissue are looked at in the lab to determine whether breast cancer is present and if so, what type it is. The lab may also perform certain tests that can help determine how quickly a cancer is likely to grow and (to some extent) what treatments are likely to be effective. Sometimes these tests aren't done on the biopsy sample, but instead they are performed on the whole cancer specimen when it is removed by either lumpectomy or mastectomy.

If a benign condition is diagnosed, you will need no further treatment. Still, it is important to find out from your doctor if the benign condition places you at higher risk for breast cancer in the future and what type of follow-up you might need.

If the diagnosis is cancer, there should be time for you to learn about the disease and to discuss treatment options with your cancer care team, friends, and family. It is usually not necessary to rush into treatment. You may want to get a second opinion before deciding on what treatment is best for you.

Type of breast cancer

The tissue removed during the biopsy (or during surgery) is first looked at under a microscope to see if cancer is present and whether it is in situ (not invasive) or invasive. The biopsy is also used to determine the cancer's type. The different types of breast cancer are defined in the section, "What is breast cancer?"

The most common types, invasive ductal and invasive lobular cancer, generally are treated in the same way.

Breast cancer grade

A pathologist also assigns a grade to the cancer, which is based on how closely the biopsy sample resembles normal breast tissue. The grade helps predict a woman's prognosis. In general, a lower grade number indicates a slower-growing cancer that is less likely to spread, while a higher number indicates a faster-growing cancer that is more likely to spread. The tumor grade is one factor in deciding the need for further treatment after surgery.

Histologic tumor grade (sometimes called the *Bloom-Richardson grade*, *Scarff-Bloom-Richardson grade*, or *Elston-Ellis grade*) is based on the arrangement of the cells in relation to each other: whether they form tubules; how closely they resemble normal breast cells (nuclear grade); and how many of the cancer cells are in the process of dividing (mitotic count). This system of grading is used for invasive cancers but not for in situ cancers.

- Grade 1 (well differentiated) cancers have relatively normal-looking cells that do not appear to be growing rapidly and are arranged in small tubules.
- Grade 2 (moderately differentiated) cancers have features between grades 1 and 3.
- Grade 3 (poorly differentiated) cancers, the highest grade, lack normal features and tend to grow and spread more aggressively.

Ductal carcinoma in situ (DCIS) is sometimes given a nuclear grade, which describes how abnormal the cancer cells appear. The presence or absence of necrosis (areas of dead or degenerating cancer cells), which might indicate a more aggressive cancer, is also noted. Other factors important in determining the prognosis for DCIS include the surgical margin (how close the cancer is to the edge of the specimen) and the size (amount of breast tissue affected by DCIS). In situ cancers with high nuclear grade, necrosis, cancer

at or near the edge of the sample, or large areas of DCIS are more likely to come back after treatment.

Estrogen receptor (ER) and progesterone receptor (PR) status

Receptors are proteins on the outside surfaces of cells that can attach to certain substances, such as hormones, that circulate in the blood. Normal breast cells and some breast cancer cells have receptors that attach to estrogen and progesterone. These 2 hormones often fuel the growth of breast cancer cells.

An important step in evaluating a breast cancer is to test a portion of the cancer removed during the biopsy (or surgery) to see if they have estrogen and progesterone receptors. Cancer cells may contain neither, one, or both of these receptors. Breast cancers that contain estrogen receptors are often referred to as *ER-positive* (or ER+) cancers, while those containing progesterone receptors are called *PR-positive* (or PR+) cancers. Women with hormone receptor–positive cancers tend to have a better prognosis and are much more likely to respond to hormone therapy than women with cancers without these receptors.

All breast cancers, with the exception of lobular carcinoma in situ (LCIS), should be tested for these hormone receptors when they have the breast biopsy or surgery. About 2 of 3 breast cancers contain at least one of these receptors. This percentage is higher in older women than in younger ones.

HER2/neu status

About 1 of 5 breast cancers have too much of a growth-promoting protein called HER2/neu (often just shortened to HER2). The HER2/neu gene instructs the cells to make this protein. Tumors with increased levels of HER2/neu are referred to as *HER2-positive*.

Women with HER2-positive breast cancers have too many copies of the HER2/neu gene, resulting in greater than normal amounts of the HER2/neu protein. These cancers tend to grow and spread more aggressively than other breast cancers.

All newly diagnosed breast cancers should be tested for HER2/neu because HER2-positive cancers are much more likely to benefit from treatment with drugs that target the HER2/neu protein, such as trastuzumab (Herceptin®) and lapatinib (Tykerb®). See the section, "How is breast cancer treated?" for more information on these drugs.

Testing of the biopsy or surgery sample is usually done in one of two ways:

- Immunohistochemistry (IHC): In this test, special antibodies that identify the HER2/neu protein are applied to the sample, which cause cells to change color if many copies are present. This color change can be seen under a microscope. The test results are reported as 0, 1+, 2+, or 3+.

- Fluorescent in situ hybridization (FISH): This test uses fluorescent pieces of DNA that specifically stick to copies of the HER2/neu gene in cells, which can then be counted under a special microscope.

Many breast cancer specialists feel the FISH test is more accurate than IHC. However, it is more expensive and takes longer to get the results. Often the IHC test is used first. If the results are 1+ (or 0), the cancer is considered HER2-negative. People with HER2-negative tumors are not treated with drugs (like trastuzumab) that target HER2. If the test comes back 3+, the cancer is HER2-positive. Patients with HER2-positive tumors may be treated with drugs like trastuzumab. When the result is 2+, the HER2 status of the tumor is not clear. This often leads to testing the tumor with FISH. Newer test methods are now becoming available as well (see "What's new in breast cancer research and treatment?").

Tests of ploidy and cell proliferation rate

The ploidy of cancer cells refers to the amount of DNA they contain. If there's a normal amount of DNA in the cells, they are said to be diploid. If the amount is abnormal, then the cells are described as aneuploid. Tests of ploidy may help determine prognosis, but they rarely change treatment and are considered optional. They are not usually recommended as part of a routine breast cancer work-up.

The S-phase fraction is the percentage of cells in a sample that are replicating (copying) their DNA. DNA replication means that the cell is getting ready to divide into 2 new cells. The rate of cancer cell division can also be estimated by a Ki-67 test. If the S-phase fraction or Ki-67 labeling index is high, it means that the cancer cells are dividing more rapidly, which indicates a more aggressive cancer.

Tests of gene patterns

Researchers have found that looking at the patterns of a number of different genes at the same time (sometimes referred to as gene expression profiling) can help predict whether or not an early stage breast cancer is likely to come back after initial treatment. Two such tests, which look at different sets of genes, are now available: the Oncotype DX® and the MammaPrint®

Oncotype DX®: The Oncotype DX test may be helpful when deciding whether additional (adjuvant) treatment with chemotherapy (after surgery) might be useful in women with certain early-stage breast cancers that usually have a low chance of coming back (stage I or II estrogen receptor–positive breast cancers without lymph node involvement). Recent data has shown it may also be helpful for patients with positive lymph nodes.

The test looks at a set of 21 genes in cells from tumor samples to determine a 'recurrence score', which is a number between 0 and 100:

- Women with a recurrence score of 17 or below have a low risk of recurrence (coming back after treatment).
- Those with a score of 18 to 30 are at intermediate risk.

- Women with a score of 31 or more are at high risk.

The test estimates risk, but it cannot tell for certain if any particular woman will have a recurrence. It is a tool that can be used, along with other factors, to help guide women and their doctors when deciding whether more treatment might be useful.

MammaPrint®: This test can be used to help determine how likely certain early-stage (stage I or II) breast cancers are to recur in a distant part of the body after initial treatment. It can be used for either ER-negative or ER-positive tumors.

The test looks at the activity of 70 different genes to determine if the cancer is low risk or high risk. This may help doctors decide if further (adjuvant) treatment might be needed.

To do a MammaPrint test, the tumor must be collected and stored in a certain way, so the decision to do this test must be made before surgery.

Usefulness of these tests: While some doctors are using these tests (along with other information) to help make decisions about offering chemotherapy, others are waiting for more research to prove they are helpful. Large clinical trials of these tests are now being done. In the meantime, women may want to discuss with their doctors whether or not these tests might be useful for them.

How is breast cancer staged?

The stage describes the extent of the cancer in the body. It is based on whether the cancer is invasive or non-invasive, the size of the tumor, how many lymph nodes are involved, and if it has spread to other parts of the body. The stage of a cancer is one of the most important factors in determining prognosis and treatment options.

Staging is the process of finding out how widespread a cancer is when it is diagnosed. Depending on the results of your physical exam and biopsy, your doctor may want you to have certain imaging tests such as a chest x-ray, mammograms of both breasts, bone scans, computed tomography (CT) scans, magnetic resonance imaging (MRI), and/or positron emission tomography (PET) scans (see below). Blood tests may also be done to evaluate your overall health and help find out if the cancer has spread to certain organs.

Imaging tests that look for breast cancer spread

Once breast cancer is diagnosed, one or more of the following tests may be done.

Chest x-ray

This test may be done to see whether the breast cancer has spread to your lungs.

Mammogram

If they haven't been done already, more extensive mammograms may be done to get more thorough views of the breasts. This is to check for any other abnormal areas that could be cancer as well. This test is described in the section, "How is breast cancer diagnosed?"

Bone scan

A bone scan can help show whether a cancer has spread (metastasized) to your bones. It can be more useful than standard x-rays because it can show all of the bones of the body at the same time.

For this test, a small amount of low-level radioactive material is injected into a vein (intravenously, or IV). The substance settles in areas of bone changes throughout the entire skeleton over the course of a couple of hours. You then lie on a table for about 30 minutes while a special camera detects the radioactivity and creates a picture of your skeleton.

Areas of bone changes appear as "hot spots" on your skeleton -- that is, they attract the radioactivity. These areas may suggest the presence of metastatic cancer, but arthritis or other bone diseases can also cause the same pattern. To distinguish between these conditions, your cancer care team may use other imaging tests such as simple x-rays or CT or MRI scans to get a better look at the areas that light up, or they may even take biopsy samples of the bone.

Computed tomography (CT) scan

The CT scan is an x-ray test that produces detailed cross-sectional images of your body. Instead of taking one picture, like a regular x-ray, a CT scanner takes many pictures as it rotates around you while you lie on a table. A computer then combines these pictures into images of slices of the part of your body being studied. In women with breast cancer, this test is most often used to look at the chest and/or abdomen to see if the cancer has spread to other organs.

Before any pictures are taken, you may be asked to drink 1 to 2 pints of a liquid called *oral contrast*. This helps outline the intestine so that certain areas are not mistaken for tumors. You may also receive an IV (intravenous) line through which a different kind of contrast dye (IV contrast) is injected. This helps better outline structures in your body.

The injection might cause some flushing (a feeling of warmth, especially in the face). Some people are allergic and get hives. Rarely, more serious reactions like trouble breathing or low blood pressure can occur. Medicine can be given to prevent and treat allergic reactions. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays.

CT scans take longer than regular x-rays. You need to lie still on a table while they are being done. During the test, the table moves in and out of the scanner, a ring-shaped

machine that completely surrounds the table. You might feel a bit confined by the ring you have to lie in while the pictures are being taken.

CT guided needle biopsy: CT scans can also be used to precisely guide a biopsy needle into a suspected area of cancer spread. For this procedure, you remain on the CT scanning table while a radiologist advances a biopsy needle through the skin and toward the location of the mass. CT scans are repeated until the doctors are sure that the needle is within the mass. A fine needle biopsy sample (tiny fragment of tissue) or a core needle biopsy sample (a thin cylinder of tissue about ½-inch long and less than 1/8-inch in diameter) is then removed and sent to be looked at under a microscope.

Magnetic resonance imaging (MRI) scan

This test is described in the sections, "Can breast cancer be found early?"and "How is breast cancer diagnosed?" as an imaging test of the breast. It may be used to examine the breast with cancer, to look for other tumors. It may also be used to look at the opposite breast, to be sure that it does not contain any tumors. It is not yet clear how helpful this is in planning surgery in someone known to have breast cancer.

MRI scans are also used to look for cancer that has spread to various parts of the body, just like CT scans. MRI scans are particularly helpful in looking at the brain and spinal cord.

MRI scans use radio waves and very strong magnets instead of x-rays. The energy from the radio waves is absorbed and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. A contrast material called *gadolinium* is often injected into a vein before the scan to better see details.

MRI scans are a little more uncomfortable than CT scans. First, they take longer -- often up to an hour. Second, you have to lie inside a narrow tube, which is confining and can upset people with claustrophobia (a fear of enclosed spaces). Newer, "open" MRI machines can sometimes help with this if needed. The machine also makes buzzing and clicking noises that you may find disturbing. Some centers provide headphones with music to block this noise out.

Ultrasound

This test is described in the section "How is breast cancer diagnosed?" as an imaging test of the breast. But ultrasound can also be used to look for cancer that has spread to some other parts of the body.

Ultrasound tests use sound waves and their echoes to produce a picture of internal organs or masses. A small microphone-like instrument called a *transducer* sends out sound waves and picks up the echoes as they bounce off body tissues. The echoes are converted by a computer into a black and white image that is shown on a computer screen. This test is painless and does not expose you to radiation.

Abdominal ultrasound can be used to look for tumors in your liver or other abdominal organs. When you have an abdominal ultrasound exam, you simply lie on a table and a technician moves the transducer over the skin overlying the part of your body being examined. Usually, the skin is first lubricated with gel.

Positron emission tomography (PET) scan

For a PET scan, glucose (a form of sugar) that contains a radioactive atom is injected into the bloodstream. Because cancer cells in the body are growing rapidly, they absorb large amounts of the radioactive sugar. After about an hour, a special camera is used to create a picture of areas of radioactivity in the body.

A PET scan is useful when your doctor thinks the cancer may have spread but doesn't know where. The picture is not finely detailed like a CT or MRI scan, but it provides helpful information about your whole body. Some newer machines are able to do both a PET and CT scan at the same time (PET/CT scan). This allows the radiologist to compare areas of higher radioactivity on the PET with the appearance of that area on the CT.

So far, most studies show it isn't very helpful in most cases of breast cancer, but it may be used when the cancer is known to have spread.

The American Joint Committee on Cancer (AJCC) TNM system

A staging system is a standardized way for the cancer care team to summarize information about how far a cancer has spread. The most common system used to describe the stages of breast cancer is the American Joint Committee on Cancer (AJCC) TNM system.

The stage of a breast cancer can be based either on the results of physical exam, biopsy, and imaging tests (called the *clinical stage*), or on the results of these tests plus the results of surgery (called the *pathologic stage*). The staging described here is the pathologic stage, which includes the findings after surgery, when the pathologist has looked at the breast mass and nearby lymph nodes. Pathologic staging is likely to be more accurate than clinical staging, as it allows the doctor to get a firsthand impression of the extent of the cancer.

The TNM staging system classifies cancers based on their T, N, and M stages:

- The letter T followed by a number from 0 to 4 describes the tumor's size and spread to the skin or to the chest wall under the breast. Higher T numbers mean a larger tumor and/or wider spread to tissues near the breast.
- The letter N followed by a number from 0 to 3 indicates whether the cancer has spread to lymph nodes near the breast and, if so, how many lymph nodes are affected.
- The letter M followed by a 0 or 1 indicates whether the cancer has spread to distant organs -- for example, the lungs or bones.

Primary tumor (T) categories:

TX: Primary tumor cannot be assessed.

T0: No evidence of primary tumor.

Tis: Carcinoma in situ (DCIS, LCIS, or Paget disease of the nipple with no associated tumor mass)

T1: Tumor is 2 cm (3/4 of an inch) or less across.

T2: Tumor is more than 2 cm but not more than 5 cm (2 inches) across.

T3: Tumor is more than 5 cm across.

T4: Tumor of any size growing into the chest wall or skin. This includes inflammatory breast cancer.

Nearby lymph nodes (N) (based on looking at them under a microscope):

Lymph node staging for breast cancer has changed over time as technology has evolved. Earlier methods were useful in finding large deposits of cancer cells in the lymph nodes, but could miss microscopic areas of cancer spread. Over time, newer methods have made it possible to find smaller and smaller deposits of cancer cells. Experts haven't been sure what to do with the new information. Do tiny deposits of cancer cells affect outlook the same way that larger deposits do? How much cancer in the lymph node is needed to see a change in outlook or treatment?

These questions are still being studied, but for now, a deposit of cancer cells must contain at least 200 cells or be at least 0.2 mm across (less than 1/100 of an inch) for it to change the N stage. An area of cancer spread that is smaller than 0.2 mm (or less than 200 cells) doesn't change the stage, but is recorded with abbreviations that reflect the way the cancer spread was detected. The abbreviation "i+" means that cancer cells were only seen when a special stain, called immunohistochemistry, was used. The abbreviation "mol+" is used if the cancer could only be found using a technique called PCR. These very tiny areas are sometimes called *isolated tumor cells*. If the area of cancer spread is at least 0.2 mm (or 200 cells), but still not larger than 2 mm, it is called a micrometastasis (one mm is about the size of the width of a grain of rice). Micrometastases are counted only if there aren't any larger areas of cancer spread. Areas of cancer spread larger than 2 mm are known to affect outlook and do change the N stage. These larger areas are sometimes called macrometastases, but may just be called metastases.

NX: Nearby lymph nodes cannot be assessed (for example, removed previously).

N0: Cancer has not spread to nearby lymph nodes.

> **N0(i+)**: Tiny amounts of cancer are found in underarm lymph nodes by using special stains. The area of cancer spread contains less than 200 cells and is smaller than 0.2 mm.

N0(mol+): Cancer cells cannot be seen in underarm lymph nodes (even using special stains), but traces of cancer cells were detected using a special test (called PCR).

N1: Cancer has spread to 1 to 3 axillary (underarm) lymph node(s), and/or tiny amounts of cancer are found in internal mammary lymph nodes (those near the breast bone) on sentinel lymph node biopsy.

N1mi: Micrometastases (tiny areas of cancer spread) in 1 to 3 lymph nodes under the arm. The areas of cancer spread in the lymph nodes are 2 mm or less across (but at least 200 cancer cells or 0.2mm across).

N1a: Cancer has spread to 1 to 3 lymph nodes under the arm with at least one area of cancer spread greater than 2 mm across.

N1b: Cancer has spread to internal mammary lymph nodes, but this spread could only be found on sentinel lymph node biopsy (it did not cause the lymph nodes to become enlarged).

N1c: Both N1a and N1b apply.

N2: Cancer has spread to 4 to 9 lymph nodes under the arm, or cancer has enlarged the internal mammary lymph nodes (either N2a or N2b, but not both).

N2a: Cancer has spread to 4 to 9 lymph nodes under the arm, with at least one area of cancer spread larger than 2 mm.

N2b: Cancer has spread to one or more internal mammary lymph nodes, causing them to become enlarged.

N3: Any of the following:

N3a: either

- Cancer has spread to 10 or more axillary lymph nodes, with at least one area of cancer spread greater than 2mm, OR
- Cancer has spread to the lymph nodes under the clavicle (collar bone), with at least one area of cancer spread greater than 2mm.

N3b: either:

- Cancer is found in at least one axillary lymph node (with at least one area of cancer spread greater than 2 mm) and has enlarged the internal mammary lymph nodes, OR
- Cancer involves 4 or more axillary lymph nodes (with at least one area of cancer spread greater than 2 mm), and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy.

N3c: Cancer has spread to the lymph nodes above the clavicle with at least one area of cancer spread greater than 2mm.

Metastasis (M):

MX: Presence of distant spread (metastasis) cannot be assessed.

M0: No distant spread is found on x-rays (or other imaging procedures) or by physical exam.

> **cM0(i +)**: Small numbers of cancer cells are found in blood or bone marrow (found only by special tests), or tiny areas of cancer spread (no larger than 0.2 mm) are found in lymph nodes away from the breast.

M1: Spread to distant organs is present. (The most common sites are bone, lung, brain, and liver.)

Breast cancer stage grouping

Once the T, N, and M categories have been determined, this information is combined in a process called *stage grouping*. Cancers with similar stages tend to have a similar outlook and thus are often treated in a similar way. Stage is expressed in Roman numerals from stage I (the least advanced stage) to stage IV (the most advanced stage). Non-invasive cancer is listed as stage 0.

Stage 0: Tis, N0, M0: This is *ductal carcinoma in situ (DCIS)*, the earliest form of breast cancer. In DCIS, cancer cells are still within a duct and have not invaded deeper into the surrounding fatty breast tissue. *Lobular carcinoma in situ (LCIS)* is sometimes also classified as stage 0 breast cancer, but most oncologists believe it is not a true breast cancer. In LCIS, abnormal cells grow within the lobules or milk-producing glands, but they do not penetrate through the wall of these lobules. Paget disease of the nipple (without an underlying tumor mass) is also stage 0. In all cases the cancer has not spread to lymph nodes or distant sites.

Stage IA: T1, N0, M0: The tumor is 2 cm (about 3/4 of an inch) or less across (T1) and has not spread to lymph nodes (N0) or distant sites (M0).

Stage IB: T0 or T1, N1mi, M0: The tumor is 2 cm or less across (or is not found) (T0 or T1) with micrometastases in 1 to 3 axillary lymph nodes (the cancer in the lymph nodes is greater than 0.2mm across and/or more than 200 cells but is not larger than 2 mm)(N1mi). The cancer has not spread to distant sites (M0).

Stage IIA: One of the following applies:

T0 or T1, N1 (but not N1mi), M0: The tumor is 2 cm or less across (or is not found) (T1 or T0) and either:

- It has spread to 1 to 3 axillary lymph nodes, with the cancer in the lymph nodes larger than 2 mm across (N1a), OR
- Tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1b), OR

- It has spread to 1 to 3 lymph nodes under the arm and to internal mammary lymph nodes (found on sentinel lymph node biopsy) (N1c).

OR

T2, N0, M0: The tumor is larger than 2 cm across and less than 5 cm (T2) but hasn't spread to the lymph nodes (N0).

The cancer hasn't spread to distant sites (M0).

Stage IIB: One of the following applies:

T2, N1, M0: The tumor is larger than 2 cm and less than 5 cm across (T2). It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1). The cancer hasn't spread to distant sites (M0).

OR

T3, N0, M0: The tumor is larger than 5 cm across but does not grow into the chest wall or skin and has not spread to lymph nodes (T3, N0). The cancer hasn't spread to distant sites (M0).

Stage IIIA: One of the following applies:

T0 to T2, N2, M0: The tumor is not more than 5 cm across (or cannot be found) (T0 to T2). It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2). The cancer hasn't spread to distant sites (M0).

OR

T3, N1 or N2, M0: The tumor is larger than 5 cm across but does not grow into the chest wall or skin (T3). It has spread to 1 to 9 axillary nodes, or to internal mammary nodes (N1 or N2). The cancer hasn't spread to distant sites (M0).

Stage IIIB: T4, N0 to N2, M0: The tumor has grown into the chest wall or skin (T4), and one of the following applies:

- It has not spread to the lymph nodes (N0).
- It has spread to 1 to 3 axillary lymph nodes and/or tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N1).
- It has spread to 4 to 9 axillary lymph nodes, or it has enlarged the internal mammary lymph nodes (N2).

The cancer hasn't spread to distant sites (M0).

Inflammatory breast cancer is classified as T4 and is stage IIIB unless it has spread to distant lymph nodes or organs, in which case it would be stage IV.

Stage IIIC: any T, N3, M0: The tumor is any size (or can't be found), and one of the following applies:

- Cancer has spread to 10 or more axillary lymph nodes (N3).
- Cancer has spread to the lymph nodes under the clavicle (collar bone) (N3).
- Cancer has spread to the lymph nodes above the clavicle (N3).
- Cancer involves axillary lymph nodes and has enlarged the internal mammary lymph nodes (N3).
- Cancer has spread to 4 or more axillary lymph nodes, and tiny amounts of cancer are found in internal mammary lymph nodes on sentinel lymph node biopsy (N3).

The cancer hasn't spread to distant sites (M0).

Stage IV: any T, any N, M1: The cancer can be any size (any T) and may or may not have spread to nearby lymph nodes (any N). It has spread to distant organs or to lymph nodes far from the breast (M1). The most common sites of spread are the bone, liver, brain, or lung,

If you have any questions about the stage of your cancer and what it might mean in your case, be sure to ask your doctor.

Breast cancer survival rates by stage

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with cancer may want to know the survival statistics for people in similar situations, while others may not find the numbers helpful, or may even not want to know them. It’s up to you if you want to read about the survival statistics below for breast cancer.

The 5-year survival rate refers to the percentage of patients who live at least 5 years after being diagnosed with cancer. Many of these patients live much longer than 5 years after diagnosis. Also, people diagnosed with cancer can die from other things, and these numbers do not take into account the fact that some of the deaths are from causes other than breast cancer.

In order to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for people now being diagnosed with (cancer).

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many other factors may affect a person's outlook, such as the the grade of the cancer and the presence of hormone receptors on the cancer cells. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with the aspects of your particular situation.

The available statistics do not divide survival rates by all of the substages, such as IA and IB. The rates for these substages are likely to be close to the rate for the overall stage. For

example, the survival rate for stage IA is likely to be slightly higher than that listed for stage I, while the survival rate for stage IB would be expected to be slightly lower.

The numbers below come from the National Cancer Data Base, and are based on people who were diagnosed with breast cancer in 2001 and 2002.

Stage	**5-year Survival Rate**
0	93%
I	88%
IIA	81%
IIB	74%
IIIA	67%
IIIB	41%*
IIIC	49%*
IV	15%

*These numbers are correct as written (stage IIIB shows worse survival than stage IIIC).

How is breast cancer treated?

This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.

The treatment information in this document is not official policy of the Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor.

Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

This section starts with general comments about the types of treatments used for breast cancer. This is followed by a discussion of the typical treatment options based on the stage of the cancer (and a small section on breast cancer treatment during pregnancy).

General types of treatment

Treatments can be classified into broad groups, based on how they work and when they are used.

Local versus systemic therapy

Local therapy is intended to treat a tumor at the site without affecting the rest of the body. Surgery and radiation therapy are examples of local therapies.

Systemic therapy refers to drugs which can be given by mouth or directly into the bloodstream to reach cancer cells anywhere in the body. Chemotherapy, hormone therapy, and targeted therapy are systemic therapies.

Adjuvant and neoadjuvant therapy

Patients who have no detectable cancer after surgery are often given adjuvant (additional) systemic therapy. Doctors believe that in some cases cancer cells may break away from the primary breast tumor and begin to spread through the body by way of the bloodstream even in the early stages of the disease. These cells can't be felt on a physical exam or seen on x-rays or other imaging tests, and they cause no symptoms. But they can go on to become new tumors in other organs or in bones. The goal of adjuvant therapy is to kill these hidden cells.

Not every patient needs adjuvant therapy. Generally speaking, if the tumor is larger or the cancer has spread to lymph nodes, it is more likely to have spread through the bloodstream. But there are other features, some of which have been previously discussed, that may determine if a patient should get adjuvant therapy. Recommendations about adjuvant therapy are discussed in the sections on these treatments and in the section on treatment by stage.

Some patients are given treatment, such as chemotherapy or hormone therapy, before surgery. The goal of this treatment is to shrink the tumor in the hope it will allow a less extensive operation to be done. This is called *neoadjuvant therapy*.

Surgery for breast cancer

Most women with breast cancer have some type of surgery. Surgery is often needed to remove a breast tumor. Options for this include breast-conserving surgery and mastectomy. Breast reconstruction can be done at the same time as the mastectomy or done later on. Surgery is also used to check the lymph nodes under the arm for cancer spread. Options for this include a sentinel lymph node biopsy and an axillary (armpit) lymph node dissection.

Breast-conserving surgery

This type of surgery is sometimes called p*artial (or segmental) mastectomy.* It only removes a part of the affected breast, but how much is removed depends on the size and location of the tumor and other factors. If radiation therapy is to be given after surgery, small metallic clips (which will show up on x-rays) may be placed inside the breast during surgery to mark the area for the radiation treatments.

Lumpectomy removes only the breast lump and a surrounding margin of normal tissue. Radiation therapy is usually given after a lumpectomy. If adjuvant chemotherapy is to be given as well, radiation is usually delayed until the chemotherapy is completed.

Quadrantectomy removes more breast tissue than a lumpectomy. For a quadrantectomy, one-quarter of the breast is removed. Radiation therapy is usually given after surgery. Again, this may be delayed if chemotherapy is to be given as well.

If cancer cells are found at any of the edges of the piece of tissue removed, it is said to have *positive margins*. When no cancer cells are found at the edges of the tissue, it is said to have *negative* or *clear margins*. The presence of positive margins means that that some cancer cells may have been left behind after surgery. If the pathologist finds positive margins in the tissue removed with surgery, the surgeon may need to go back and remove more tissue. This operation is called a *re-excision*. If the surgeon can't remove enough breast tissue to get clear surgical margins, a mastectomy may be needed.

For most women with stage I or II breast cancer, breast-conservation therapy (lumpectomy/partial mastectomy plus radiation therapy) is as effective as mastectomy. Survival rates of women treated with these 2 approaches are the same. But breast-conservation therapy is not an option for all women with breast cancer (see the section, "Choosing between lumpectomy and mastectomy" below).

Radiation therapy can sometimes be omitted as a part of breast-conserving therapy. This is somewhat controversial, so women may consider lumpectomy without radiation therapy if all of the following are true:

- They are age 70 years or older.
- They have a tumor that measures 2 cm or less across that has been completely removed (with clear margins).
- The tumor is hormone receptor-positive, and the women are getting hormone therapy (such as tamoxifen or an aromatase inhibitor).
- No lymph nodes contained cancer.

You should discuss this possibility with your health care team.

Possible side effects: Side effects of these operations can include pain, temporary swelling, tenderness, and hard scar tissue that forms in the surgical site. As with all operations, bleeding and infection at the surgery site are also possible.

The larger the portion of breast removed, the more likely it is that there will be a noticeable change in the shape of the breast afterward. If the breasts look very different after surgery, it may be possible to have some type of reconstructive surgery (see the section, "Reconstructive surgery"), or to have the unaffected breast reduced in size to make the breasts more symmetrical. It may even be possible to have this done during the initial surgery. It's very important to talk with your doctor (and possibly a plastic surgeon) before surgery to get an idea of how your breasts are likely to look afterward, and to learn what your options might be.

Mastectomy

Mastectomy is surgery to remove the entire breast. All of the breast tissue is removed, sometimes along with other nearby tissues.

Simple mastectomy: In this procedure, also called *total mastectomy*, the surgeon removes the entire breast, including the nipple, but does not remove underarm lymph nodes or muscle tissue from beneath the breast. Sometimes this is done for both breasts (a double mastectomy), especially when it is done as preventive surgery in women at very high risk for breast cancer. Most women, if they are hospitalized, can go home the next day.

Skin-sparing mastectomy: For some women considering immediate reconstruction, a skin-sparing mastectomy can be done. In this procedure, most of the skin over the breast (other than the nipple and areola) is left intact. This can work as well as a simple mastectomy. The amount of breast tissue removed is the same as with a simple mastectomy.

This approach is only used when immediate breast reconstruction is planned. It may not be suitable for larger tumors or those that are close to the skin. Implants or tissue from other parts of the body are used to reconstruct the breast. This approach has not been used for as long as the more standard type of mastectomy, but many women prefer it because it offers the advantage of less scar tissue and a reconstructed breast that seems more natural.

A variation of the skin-sparing mastectomy is the *nipple-sparing mastectomy*. This procedure is more often an option for women who have a small early stage cancer near the outer part of the breast, with no signs of cancer in the skin or near the nipple. In this procedure, the breast tissue is removed, but the breast skin and nipple are left in place. This is followed by breast reconstruction. The surgeon often removes the breast tissue beneath the nipple (and areola) during the procedure, to check for cancer cells. If cancer is found in this tissue, the nipple is involved with cancer and must be removed. Even when no cancer is found under the nipple, some doctors give the nipple tissue a dose of radiation during or after the surgery to try and reduce the risk of the cancer coming back.

There are still some problems with nipple-sparing surgeries. Afterward, the nipple does not have a good blood supply, so sometimes it can wither away or become deformed. Because the nerves are also cut, there is little or no feeling left in the nipple. In women with larger breasts, the nipple may look out of place after the breast is reconstructed. As a result, many doctors feel that this surgery is best done in women with small to medium sized breasts. This procedure leaves less visible scars, but if it isn't done properly, it can leave behind more breast tissue than other forms of mastectomy. This could result in a higher risk of cancer developing in than for a skin-sparing or simple mastectomy. This was a problem in the past, but improvements in technique have helped make this surgery safer. Still, many experts consider nipple-sparing procedures too risky to be a standard treatment of breast cancer.

Modified radical mastectomy: This procedure is a simple mastectomy plus removal of axillary (underarm) lymph nodes. Surgery to remove these lymph nodes is discussed in further detail later in this section.

Radical mastectomy: In this extensive operation, the surgeon removes the entire breast, axillary lymph nodes, and the pectoral (chest wall) muscles under the breast. This surgery was once very common, but it was found that a modified radical mastectomy was just as effective. This meant that the disfigurement and side effects of a radical mastectomy were not needed, so these surgeries are rarely done now. This operation may still be done for large tumors that are growing into the pectoral muscles under the breast.

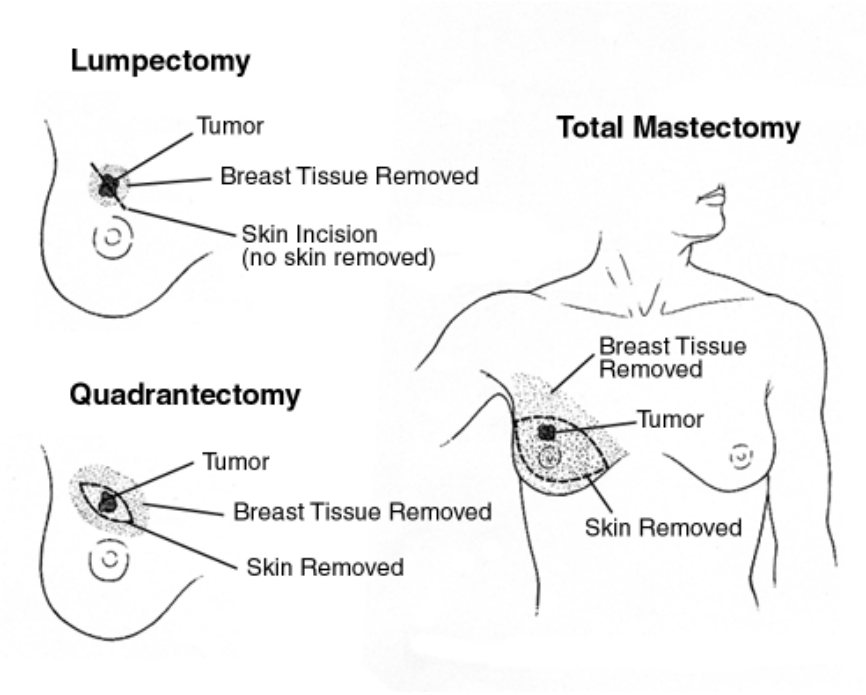
Possible side effects: Aside from post-surgical pain and the obvious change in the shape of the breast(s), possible side effects of mastectomy include wound infection, hematoma (buildup of blood in the wound), and seroma (buildup of clear fluid in the wound). If axillary lymph nodes are also removed, other side effects may occur (see the section, "Axillary lymph node dissection").

Choosing between lumpectomy and mastectomy

Many women with early-stage cancers can choose between breast-conserving surgery and mastectomy.

The main advantage of a lumpectomy is that it allows a woman to keep most of her breast. A disadvantage is the usual need for radiation therapy -- most often for 5 to 6 weeks -- after surgery. A small number of women having breast-conserving surgery may not need radiation while a small percentage of women who have a mastectomy will still need radiation therapy to the breast area.

When deciding between a lumpectomy and mastectomy, be sure to get all the facts. You may have an initial gut preference for mastectomy as a way to "take it all out as quickly as possible." This feeling can lead women tend to prefer mastectomy more often than their surgeons do. But the fact is that in most cases, mastectomy does not give you any better chance of long-term survival or a better outcome from treatment. Studies following thousands of women for more than 20 years show that when a lumpectomy can be done, doing mastectomy instead does not provide any better chance of survival.



Most women and their doctors prefer lumpectomy and radiation therapy when it's a reasonable option, but your choice will depend on a number of factors, such as:

- How you feel about losing your breast
- How you feel about getting radiation therapy
- How far you would have to travel and how much time it would take to have radiation therapy
- Whether you think you will want to have more surgery to reconstruct your breast after having a mastectomy
- Your preference for mastectomy as a way to get rid of all your cancer as quickly as possible
- Your fear of the cancer coming back

For some women, mastectomy may clearly be a better option. For example, lumpectomy or breast conservation therapy is usually not recommended for:

- Women who have already had radiation therapy to the affected breast
- Women with 2 or more areas of cancer in the same breast that are too far apart to be removed through 1 surgical incision, while keeping the appearance of the breast satisfactory
- Women whose initial lumpectomy along with re-excision(s) has not completely removed the cancer

- Women with certain serious connective tissue diseases such as scleroderma or lupus, which may make them especially sensitive to the side effects of radiation therapy
- Pregnant women who would require radiation while still pregnant (risking harm to the fetus)
- Women with large tumors (greater than 5 cm (2 inches) across) that didn't shrink very much with neoadjuvant chemotherapy
- Women with inflammatory breast cancer
- Women with a cancer that is large relative to her breast size

Other factors may need to be taken into account as well. For example, young women with breast cancer and a known BRCA mutation are at very high risk for a second cancer. These women often consider having the other breast removed to reduce this risk, and so may choose to have the cancer treated with a mastectomy, as well. A double mastectomy may be done to both treat the cancer and reduce the risk of a second breast cancer.

Axillary lymph node dissection

To determine if the breast cancer has spread to axillary (underarm) lymph nodes, some of these lymph nodes may be removed and looked at under the microscope. This is an important part of staging and determining treatment and outcomes. When the lymph nodes contain cancer cells, there is a higher chance that cancer cells have also spread through the bloodstream to other parts of the body.

As noted above, axillary lymph node dissection is part of a radical or modified radical mastectomy procedure. It may also be done along with a breast-conserving procedure, like a lumpectomy. Anywhere from about 10 to 40 (though usually less than 20) lymph nodes are removed.

The presence of cancer cells in the lymph nodes under the arm is an important factor in considering adjuvant therapy. Axillary dissection is used as a test to help guide other breast cancer treatment decisions.

Possible side effects: As with other operations, pain, swelling, bleeding, and infection are possible.

The main possible long-term effect of removing axillary lymph nodes is lymphedema (swelling) of the arm. This occurs because any excess fluid in the arms normally travels back into the bloodstream through the lymphatic system. Removing the lymph nodes sometimes blocks the drainage from the arm, causing this fluid to remain and build up.

Up to 30% of women who have underarm lymph nodes removed develop lymphedema. It also occurs in up to 3% of women who have a sentinel lymph node biopsy (see below). It may be more common if radiation is given after surgery. Sometimes the swelling lasts for only a few weeks and then goes away. Other times, the swelling lasts a long time. Ways to help prevent or reduce the effects of lymphedema are discussed in the section, "What

happens after treatment for breast cancer?". If your arm is swollen, tight, or painful after lymph node surgery, be sure to tell someone on your cancer care team right away.

You may also have short- or long-term limitations in moving your arm and shoulder after surgery. Your doctor may give you exercises to ensure that you do not have permanent problems with movement (a frozen shoulder). Numbness of the skin of the upper, inner arm is another common side effect because the nerve that controls sensation here travels through the lymph node area.

Sentinel lymph node biopsy

Although axillary lymph node dissection (ALND) is a safe operation and has low rates of most side effects, removing many lymph nodes increases the chance that the patient will have lymphedema after surgery. To lower the risk of lymphedema, the doctors may use a sentinel lymph node biopsy (SLNB) procedure to check the lymph nodes for cancer. This procedure is a way of learning if cancer has spread to lymph nodes without removing all of them.

In this procedure the surgeon finds and removes the first lymph node(s) to which a tumor drains. This lymph node, known as the sentinel node, is the one most likely to contain cancer cells if they have started to spread. To do this, the surgeon injects a radioactive substance and/or a blue dye into the tumor or the area around it. Lymphatic vessels will carry these substances into the sentinel node(s). The doctor can use a special device to detect the radioactivity in the nodes that the radioactive substance flows into or can look for lymph nodes that have turned blue. These are separate ways to find the sentinel node, but are often done together as a double check. The doctor then cuts the skin over the area and removes the node(s) containing the dye (or radiation). These nodes (often 2 or 3) are then looked at closely by the pathologist. (Because fewer nodes are removed than in an ALND, each one can be looked at more closely for any cancer).

The lymph node can sometimes be checked for cancer during surgery. If cancer is found in the sentinel lymph node, the surgeon may go on to remove more lymph nodes or even do a full axillary dissection. If no cancer cells are seen in the lymph node at the time of the surgery, or if the sentinel node is not checked at the time of the surgery, the lymph node(s) will be examined in greater detail over the next several days. If cancer is found in the lymph node, the surgeon may recommend a full axillary lymph node dissection at a later time.

If there is no cancer in the sentinel node(s), it's very unlikely that the cancer has spread to other lymph nodes, so no further lymph node surgery is needed. The patient can avoid the potential side effects of a full ALND (see above).

Until recently, if the sentinel node(s) had cancer, the surgeon would do a full axillary lymph node dissection to see how many other lymph nodes were involved. A recent study has shown that this may not always be needed. In some cases, it may be just as safe to leave the rest of the lymph nodes behind. This is based on certain factors, such as the size of the tumor and what treatment is planned after surgery.

Although this has become a common procedure, sentinel lymph node biopsy requires a great deal of skill. It should be done only by a surgical team known to have experience with this technique. If you are thinking about having this type of biopsy, ask your health care team if they do them regularly.

Possible side effects: As with other operations, pain, swelling, bleeding, and infection are possible.

The main possible long-term effect of a sentinel lymph node biopsy is lymphedema of the arm. This occurs less often than with a full ALND, but it can still happen. This is discussed in more detail in the section, “Axillary lymph node dissection” (above).

Reconstructive surgery

After having a mastectomy (or some breast-conserving surgeries), a woman may want to consider having the breast mound rebuilt; this is called *breast reconstruction*. These procedures are not done to treat cancer but to restore the breast's appearance after surgery. If you are going to have breast surgery and are thinking about having reconstruction, it is important to consult with a plastic surgeon who is an expert in breast reconstruction before your surgery.

Decisions about the type of reconstruction and when it will be done depend on each woman's medical situation and personal preferences. You may have a choice between having your breast reconstructed at the same time as the mastectomy (immediate reconstruction) or at a later time (delayed reconstruction). There are several types of reconstructive surgery. Some use saline (salt water) or silicone implants, while others use tissues from other parts of your body (autologous tissue reconstruction).

For a discussion of the different reconstruction options, see our document, *Breast Reconstruction After Mastectomy*. You may also find it helpful to talk with a woman who has had the type of reconstruction you might be considering. Our Reach to Recovery volunteers can help you with this.

What to expect with surgery

For many, the thought of surgery can be frightening. But with a better understanding of what to expect before, during, and after the operation, many fears can be relieved.

Before surgery: The common biopsy procedures let you find out if you have breast cancer within a few days of your biopsy, but the extent of the breast cancer will not be known until after imaging tests and the surgery for local treatment are done.

Usually, you meet with your surgeon a few days before the operation to discuss the procedure. This is a good time to ask specific questions about the surgery and review potential risks. Be sure you understand what the extent of the surgery is likely to be and what you should expect afterward. If you are thinking about breast reconstruction, ask about this as well.

You will be asked to sign a consent form, giving the doctor permission to perform the surgery. Take your time and review the form carefully to be certain that you understand what you are signing. Sometimes, doctors send material for you to review in advance of your appointment, so you will have plenty of time to read it and won't feel rushed. You may also be asked to give consent for researchers to use any tissue or blood that is not needed for diagnostic purposes. Although this may not be of direct use to you, it may be very helpful to women in the future.

You may be asked to donate blood before some operations, such as a mastectomy combined with natural tissue reconstruction, if the doctors think a transfusion might be needed. You might feel more secure knowing that if a transfusion is needed, you will receive your own blood. If you do not receive your own blood, it is important to know that in the United States, blood transfusion from another person is nearly as safe as receiving your own blood. Ask your doctor about your possible need for a blood transfusion.

Your doctor will review your medical records and ask you about any medicines you are taking. This is to be sure that you are not taking anything that might interfere with the surgery. For example, if you are taking aspirin, arthritis medicine, or a blood-thinning drug (like coumadin), you may be asked to stop taking the drug about a week or 2 before the surgery. Be sure you tell your doctor about everything you take, including vitamins and herbal supplements. Usually, you will be told not to eat or drink anything for 8 to 12 hours before the surgery, especially if you are going to have general anesthesia (will be asleep during surgery).

You will also meet with the anesthesiologist or nurse anesthetist, the health professional who will be giving you the anesthesia during your surgery. The type of anesthesia used depends largely on the kind of surgery being done and your medical history.

Surgery: Depending on the likely extent of your surgery, you may be offered the choice of an outpatient procedure (where you go home the same day) or you may be admitted to the hospital.

General anesthesia is usually given whenever the surgery involves a mastectomy or an axillary node dissection, and is most often used during breast-conserving surgery as well. You will have an IV (intravenous) line put in (usually in a vein in your arm), which the medical team will use to give medicines that may be needed during the surgery. Usually you will be hooked up to an electrocardiogram (EKG) machine and have a blood pressure cuff on your arm, so your heart rhythm and blood pressure can be checked during the surgery.

The length of the operation depends on the type of surgery being done. For example, a mastectomy with axillary lymph node dissection will usually take from 2 to 3 hours. After your surgery, you will be taken to the recovery room, where you will stay until you are awake and your condition and vital signs (blood pressure, pulse, and breathing) are stable.

After surgery: How long you stay in the hospital depends on the type of surgery being done, your overall state of health and whether you have any other medical problems, how

well you do during the surgery, and how you feel after the surgery. Decisions about the length of your stay should be made by you and your doctor and not dictated by what your insurance will pay, but it is important to check your insurance coverage before surgery.

In general, women having a mastectomy and/or axillary lymph node dissection stay in the hospital for 1 or 2 nights and then go home. However, some women may be placed in a 23-hour, short-stay observation unit before going home.

Less involved operations such as lumpectomy and sentinel lymph node biopsy are usually done in an outpatient surgery center, and an overnight stay in the hospital is usually not needed.

You may have a dressing (bandage) over the surgery site that may wrap snugly around your chest. You may have one or more drains (plastic or rubber tubes) coming out from the breast or underarm area to remove blood and lymph fluid that collects during the healing process. Your health care team will teach you how to care for the drains, which may include emptying and measuring the fluid and identifying problems the doctor or nurse needs to know about. Most drains stay in place for 1 or 2 weeks. When drainage has decreased to about 30 cc (1 fluid ounce) each day, the drain will usually be removed.

Most doctors will want you to start moving your arm soon after surgery so that it won't get stiff.

Many women who have a lumpectomy or mastectomy are often surprised by how little pain they have in the breast area. But they are less happy with the strange sensations (numbness, pinching/pulling feeling) they may feel in the underarm area.

Ask your health care team how to care for your surgery site and arm. Usually, they will give you and your caregivers written instructions about care after surgery. These instructions should include:

- The care of the surgical wound and dressing
- How to monitor drainage and take care of the drains
- How to recognize signs of infection
- When to call the doctor or nurse
- When to begin using the arm and how to do arm exercises to prevent stiffness
- When to resume wearing a bra
- When to begin using a prosthesis and what type to use (after mastectomy)
- What to eat and not to eat
- Use of medications, including pain medicines and possibly antibiotics
- Any restrictions of activity
- What to expect regarding sensations or numbness in the breast and arm

- What to expect regarding feelings about body image
- When to see your doctor for a follow-up appointment
- Referral to a Reach to Recovery volunteer. Through our Reach to Recovery program, a specially trained volunteer who has had breast cancer can provide information, comfort, and support (see our document, *Reach to Recovery* for more information).

Most patients see their doctor about 7 to 14 days after the surgery. Your doctor should explain the results of your pathology report and talk to you about the need for further treatment. If you will need more treatment, you may be referred to a radiation oncologist and/or a medical oncologist. If you are thinking about breast reconstruction, you may be referred to a plastic surgeon as well.

Post-mastectomy pain syndrome

Post-mastectomy pain syndrome (PMPS) is chronic nerve (neuropathic) pain after lumpectomy or mastectomy. Studies have shown that between 20% and 60% of women develop PMPS after surgery, but it is often not recognized as such. The classic signs of PMPS are chest wall pain and tingling down the arm. Pain may also be felt in the shoulder, scar, arm, or armpit. Other common complaints include numbness, shooting or pricking pain, or unbearable itching.

PMPS is thought to be linked to damage done to the nerves in the armpit and chest during surgery. But the causes are not known. Because major surgeries are less often used to treat breast cancer today, PMPS is becoming less of a problem.

It is important to talk to your doctor about any pain you are having. PMPS can cause you to not use your arm the way you should and over time you could lose the ability to use it normally.

PMPS can be treated. Opioids or narcotics are medicines commonly used to treat pain, but they don't always work well for nerve pain. But there are medicines and treatments that do work for this kind of pain. Talk to your doctor to get the pain control you need.

Radiation therapy

Radiation therapy is treatment with high-energy rays or particles that destroy cancer cells. This treatment may be used to kill any cancer cells that remain in the breast, chest wall, or underarm area after breast-conserving surgery. Radiation may also be needed after mastectomy in patients with either a cancer larger than 5 cm in size, or when cancer is found in the lymph nodes.

Radiation therapy can be given in 2 main ways.

External beam radiation

This is the most common type of radiation therapy for women with breast cancer. The radiation is focused from a machine outside the body on the area affected by the cancer.

The extent of radiation depends on whether a lumpectomy or mastectomy was done and whether or not lymph nodes are involved. If a lumpectomy was done, most often the entire breast gets radiation, and an extra boost of radiation is given to the area in the breast where the cancer was removed to prevent it from coming back in that area. Depending on the size and extent of the cancer, radiation may include the chest wall and underarm area as well. In some cases, the area treated may also include supraclavicular lymph nodes (nodes above the collarbone) and internal mammary lymph nodes (nodes beneath the breast bone in the center of the chest).

When given after surgery, external radiation therapy is usually not started until the tissues have been able to heal, often a month or longer. If chemotherapy is to be given as well, radiation therapy is usually delayed until chemotherapy is complete.

Before your treatments start, the radiation team will take careful measurements to determine the correct angles for aiming the radiation beams and the proper dose of radiation. They will make some ink marks or small tattoos on your skin that they will use later as a guide to focus the radiation on the right area. You may want to talk to your health care team to find out if these marks will be permanent.

Lotions, powders, deodorants, and antiperspirants can interfere with external beam radiation therapy, so your health care team may tell you not to use them until treatments are complete.

External radiation therapy is much like getting an x-ray, but the radiation is more intense. The procedure itself is painless. Each treatment lasts only a few minutes, but the setup time -- getting you into place for treatment -- usually takes longer.

The most common way breast radiation is given is 5 days a week (Monday thru Friday) for about 5 to 6 weeks.

Accelerated breast irradiation: The standard approach of giving external radiation for 5 day a week over many weeks can be inconvenient for many women. Some doctors are now using other schedules, such as giving slightly larger daily doses over only 3 weeks. Giving radiation in larger doses using fewer treatments is known as *hypofractionated radiation therapy.* This approach was studied in a large group of women who had been treated with breast conserving surgery and who did not have cancer spread to underarm lymph nodes. When compared with giving the radiation over 5 weeks, giving it over only 3 weeks was just as good at keeping the cancer from coming back in the same breast over the first 10 years after treatment. Newer approaches now being studied give radiation over an even shorter period of time. In one approach, larger doses of radiation are given each day, but the course of radiation is shortened to only 5 days. *Intraoperative radiation therapy* (IORT) is another approach that gives a single large dose of radiation in the operating room right after lumpectomy (before the breast incision is closed).

Other forms of accelerated radiation are described below in the section, “Brachytherapy.” It is hoped that these newer approaches may prove to be at least equal to the current, standard breast irradiation, but few studies have been done comparing these new methods directly to standard radiation therapy. It is not known if all of the newer methods will still be as good as standard radiation after many years. This is why many doctors still consider

them to be experimental at this time. Women who are interested in these approaches may want to ask their doctor about taking part in clinical trials of accelerated breast irradiation now going on.

3D-conformal radiotherapy: In this technique, the radiation is given with special machines so that it is aimed better at the area where the tumor was. This allows more of the healthy breast to be spared. Treatments are given twice a day for 5 days. Because only part of the breast is treated, this is considered to be a form of *accelerated partial breast irradiation*.

Possible side effects of external radiation: The main short-term side effects of external beam radiation therapy are swelling and heaviness in the breast, sunburn-like skin changes in the treated area, and fatigue. Your health care team may advise you to avoid exposing the treated skin to the sun because it may make the skin changes worse. Changes to the breast tissue and skin usually go away in 6 to 12 months.

In some women, the breast becomes smaller and firmer after radiation therapy. Having radiation may also affect a woman's chances to have breast reconstruction. Women who have had breast radiation may have problems breast feeding later on. Radiation to the breast can also sometimes damage some of the nerves to the arm. This is called *brachial plexopathy* and can lead to numbness, pain, and weakness in the shoulder, arm and hand.

Radiation therapy of axillary lymph nodes also can cause lymphedema (see the section, "What will happen after treatment for breast cancer?").

In rare cases, radiation therapy may weaken the ribs, which could lead to a fracture. In the past, parts of the lungs and heart were more likely to get some radiation, which could lead to long-term damage of these organs in some women. Modern radiation therapy equipment allows doctors to better focus the radiation beams, so these problems are rare today.

A very rare complication of radiation to the breast is the development of another cancer called angiosarcoma (see the section, "What is breast cancer?"). These rare cancers can grow and spread quickly.

Brachytherapy

Brachytherapy, also known as *internal radiation*, is another way to deliver radiation therapy. Instead of aiming radiation beams from outside the body, radioactive seeds or pellets are placed directly into the breast tissue next to the cancer. It is often used as a way to add an extra boost of radiation to the tumor site (along with external radiation to the whole breast), although it may also be used by itself (see below). Tumor size, location, and other factors may limit who can get brachytherapy.

There are different types of brachytherapy.

Intracavitary brachytherapy: This method of brachytherapy consists of a small balloon attached to a thin tube. The deflated balloon is inserted into the space left by the lumpectomy and is filled with a salt water solution. (This can be done at the time of

lumpectomy or within several weeks afterward.) The balloon and tube are left in place throughout treatment (with the end of the tube sticking out of the breast). Twice a day a source of radioactivity is placed into the middle of the balloon through the tube and then removed. This is done for 5 days as an outpatient treatment. The balloon is then deflated and removed. This system goes by the brand name, Mammosite®. This type of brachytherapy can also be considered a form of accelerated partial breast irradiation. Like many forms of accelerated breast irradiation, there are no studies comparing outcomes with this type of radiation directly with standard external beam radiation. It is not known if the long-term outcomes will be as good.

Interstitial brachytherapy: In this approach, several small, hollow tubes called catheters are inserted into the breast around the area of the lumpectomy and are left in place for several days. Radioactive pellets are inserted into the catheters for short periods of time each day and then removed. This method of brachytherapy has been around longer (and has more evidence to support it), but it is not used as much anymore.

While these methods are sometimes used as ways to add a boost of radiation to the tumor site (along with external radiation to the whole breast), they are also being studied in clinical trials as the only source of radiation for women who have had a lumpectomy. In this sense they can also be considered forms of *accelerated partial breast irradiation*. Early results have been promising, but long-term results are not yet available, and it's not yet clear if irradiating only the area around the cancer will reduce the chances of the cancer coming back as much as giving radiation to the whole breast. The results of studies now being done will probably be needed before more doctors recommend accelerated partial breast irradiation as a standard treatment option.

Chemotherapy

Chemotherapy (often called “chemo”) is treatment with cancer-killing drugs that may be given intravenously (injected into a vein) or by mouth. The drugs travel through the bloodstream to reach cancer cells in most parts of the body. Chemo is given in cycles, with each period of treatment followed by a recovery period. Treatment usually lasts for several months.

When is chemotherapy used?

There are several situations in which chemotherapy may be recommended.

Adjuvant chemotherapy: When therapy is given to patients with no evidence of cancer after surgery, it is called adjuvant therapy. Surgery is used to remove all of the cancer that can be seen, but adjuvant therapy is used to kill any cancer cells that may have been left behind that can't be seen. Adjuvant therapy after breast-conserving surgery or mastectomy reduces the risk of breast cancer coming back. Both chemotherapy and hormone therapy can be used as adjuvant treatments.

Even in the early stages of the disease, cancer cells may break away from the primary breast tumor and spread through the bloodstream. These cells don't cause symptoms, they don't show up on imaging tests, and they can't be felt during a physical exam. But if they

are allowed to grow, they can establish new tumors in other places in the body. The goal of adjuvant chemotherapy is to kill undetected cells that have traveled from the breast.

Neoadjuvant chemotherapy: Chemotherapy given before surgery is called neoadjuvant therapy. Often, neoadjuvant therapy uses the same chemo that is used as adjuvant therapy (only it is given before surgery instead of after). In terms of survival, there is no difference between giving chemo before or after surgery. The major benefit of neoadjuvant chemotherapy is that it can shrink large cancers so that they are small enough to be removed by lumpectomy instead of mastectomy. Another possible advantage of neoadjuvant chemotherapy is that doctors can see how the cancer responds to chemotherapy. If the tumor does not shrink, your doctor may try different chemotherapy drugs.

Chemotherapy for advanced breast cancer: Chemotherapy can also be used as the main treatment for women whose cancer has already spread outside the breast and underarm area at the time it is diagnosed, or if it spreads after initial treatments. The length of treatment depends on whether the cancer shrinks, how much it shrinks, and how a woman tolerates treatment.

How is chemotherapy given?

In most cases (especially for adjuvant and neoadjuvant treatment), chemotherapy is most effective when combinations of more than one drug are used. Many combinations are being used, and it's not clear that any single combination is clearly the best. Clinical studies continue to compare today's most effective treatments against something that may be better.

Some of the most commonly used drug combinations are:

- CMF: cyclophosphamide (Cytoxan®), methotrexate, and 5-fluorouracil (fluorouracil, 5-FU)
- CAF (or FAC): cyclophosphamide, doxorubicin (Adriamycin®), and 5-fluorouracil
- AC: doxorubicin (Adriamycin) and cyclophosphamide
- EC: epirubicin (Ellence®) and cyclophosphamide
- TAC: docetaxel (Taxotere®), doxorubicin (Adriamycin), and cyclophosphamide
- AC → T: doxorubicin (Adriamycin) and cyclophosphamide followed by paclitaxel (Taxol®) or docetaxel (Taxotere) [Trastuzumab (Herceptin®) may be given with the paclitaxel or docetaxel for HER2/neu positive tumors.]
- A → CMF: doxorubicin (Adriamycin), followed by CMF
- CEF (FEC): cyclophosphamide, epirubicin, and 5-fluorouracil (this may be followed by docetaxel)
- TC: docetaxel (Taxotere) and cyclophosphamide

- TCH: docetaxel, carboplatin, and trastuzumab for HER2/neu positive tumors

Other chemotherapy drugs used for treating women with breast cancer include cisplatin, vinorelbine (Navelbine®), capecitabine (Xeloda®), liposomal doxorubicin (Doxil®), gemcitibine (Gemzar®), mitoxantrone, ixabepilone (Ixempra®), and albumin-bound paclitaxel (Abraxane®). The targeted therapy drugs trastuzumab and lapatinib (Tykerb®) may be used with these chemo drugs for tumors that are HER2/neu-positive (these drugs are discussed in more detail in the "Targeted therapy" section).

Doctors give chemotherapy in cycles, with each period of treatment followed by a rest period. The chemotherapy begins on the first day of each cycle, and then the body is given time to recover from the effects of chemotherapy. The chemotherapy drugs are then repeated to start the next cycle. The time between giving the chemotherapy drugs is generally 2 or 3 weeks and varies according the specific chemotherapy drug or combination of drugs. Some drugs are given more often. These cycles generally last for a total time of 3 to 6 months when given as adjuvant therapy, depending on the drugs used. Treatment may be longer for advanced breast cancer.

Dose-dense chemotherapy: Doctors have found that giving the cycles of chemo closer together can lower the chance that the cancer will come back and improve survival in some women. This usually means giving the same chemo that is normally given every 3 weeks (such as AC → T), but giving it every 2 weeks. In addition, a drug (growth factor) to help boost the white blood cell count is given after the chemo to make sure the white blood cell count returns to normal in time for the next cycle. This approach can lead to more side effects and be harder to take, so it is only used for treatment in women with a higher chance of the cancer coming back after treatment.

Possible side effects

Chemotherapy drugs work by attacking cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, like those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemotherapy, which can lead to side effects. Some women have many side effects while other women may have few.

The side effects of chemotherapy depend on the type of drugs, the amount taken, and the length of treatment. Some of the most common possible side effects include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Increased chance of infections (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelet counts)

- Fatigue (due to low red blood cell counts and other reasons)

These side effects are usually short-term and go away after treatment is finished. It's important to let your health care team know if you have any side effects, as there are often ways to lessen them. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Several other side effects are also possible. Some of these are only seen with certain chemotherapy drugs. Your cancer care team will give you information about the possible side effects of the specific drugs you are getting.

Menstrual changes: For younger women, changes in menstrual periods are a common side effect of chemotherapy. Premature menopause (not having any more menstrual periods) and infertility (not being able to become pregnant) may occur and may be permanent. Some chemotherapy drugs are more likely to do this than others. The older a woman is when she receives chemotherapy, the more likely it is that she will become infertile or menopausal as a result. When this happens, it can also lead to rapid bone loss from osteoporosis. There are medicines that can treat or help prevent problems with bone loss.

You cannot depend on chemotherapy to prevent pregnancy, and getting pregnant while receiving chemotherapy could lead to birth defects and interfere with treatment. This is why it’s important that pre-menopausal women who are sexually active discuss using birth control with their doctor. It is safe to have children after chemotherapy, but it's not safe to get pregnant while on treatment. If you are pregnant when you get breast cancer, you still can be treated. Chemotherapy can be safely given during the last 2 trimesters of pregnancy.

Neuropathy: Several drugs used to treat breast cancer, including the taxanes (docetaxel and paclitaxel), platinum agents (carboplatin, cisplatin), and ixabepilone, can damage nerves outside of the brain and spinal cord. This can sometimes lead to symptoms (mainly in the hands and feet) like numbness, pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. In most cases this goes away once treatment is stopped, but it may be long-lasting in some women.

Heart damage: Doxorubicin, epirubicin, and some other drugs may cause permanent heart damage if used for a long time or in high doses, so doctors often check the patient's heart function before starting one of these drugs. They also carefully control the doses and use echocardiograms or other heart tests to monitor heart function. If the heart function begins to decline, treatment with these drugs will be stopped. Still, in some patients, heart damage takes a long time to develop. They may not show signs of poor heart function until months or years after treatment stops. Heart damage from these drugs happens more often if the targeted therapy drug trastuzumab is used as well, so doctors are more cautious when these drugs are used together.

Hand-foot syndrome: Certain chemo drugs, such as capecitabine and liposomal doxorubicin, can cause problems with irritation that affects the palms of the hands and the soles of the feet. This is called hand-foot syndrome. Early symptoms include numbness, tingling, and redness. If it gets worse, the hands and feet become swollen with

discomfort or even pain. The skin may blister, leading to peeling of the skin. There is no specific treatment, but these symptoms gradually get better when the drug is stopped. The best way to prevent severe hand-foot syndrome is to tell your doctor when early symptoms come up, so that the drug dose can be changed. This syndrome can also occur when the drug 5-FU is given as an IV infusion over several days (which is not common in the treatment of breast cancer).

Chemo brain: Another possible side effect of chemotherapy is "chemo brain." Many women who get chemotherapy for breast cancer report a slight decrease in mental functioning. There may be some problems with concentration and memory, which may last a long time. Still, most women do function well after chemotherapy. In studies that have found chemo brain to be a side effect of treatment, the symptoms most often go away within a few years. For more information, see our document, *Chemo brain*.

Increased risk of leukemia: Very rarely, certain chemotherapy drugs can permanently damage the bone marrow, leading to acute myeloid leukemia, a life-threatening cancer of white blood cells. When this happens it is usually within 10 years after treatment. In most women, chemotherapy's benefits in preventing breast cancer from coming back or in extending life are likely to far exceed the risk of this serious but rare complication.

Feeling unwell or tired: Many women do not feel as healthy after receiving chemotherapy as they did before. There is often a residual feeling of body pain or achiness and a mild loss of physical functioning. These are very subtle changes that are only revealed by closely questioning women who have undergone chemotherapy.

Fatigue is another common (but often overlooked) problem for women who have received chemotherapy. This may last up to several years. It can often be helped, so it is important to let your doctor or nurse know about it. For more information on what you can do about fatigue, see our document, *Fatigue in People with Cancer*. Exercise, naps, and conserving energy may be recommended. If there are sleep problems, these can be treated. Sometimes there is depression, which may be helped by counseling and/or medicines.

Hormone therapy

Hormone therapy is another form of systemic therapy. It is most often used as an adjuvant therapy to help reduce the risk of cancer recurrence after surgery, but it can be used as neoadjuvant treatment, as well. It is also used to treat cancer that has come back after treatment or has spread.

A woman's ovaries are the main source of the hormone *estrogen* up until menopause. After menopause, smaller amounts are still made in the body's fat tissue, where a hormone made by the adrenal gland is converted into estrogen.

Estrogen promotes the growth of about 2 out of 3 of breast cancers -- those containing receptors for the hormones estrogen (ER-positive cancers) and/or progesterone (PR-positive cancers). Because of this, several approaches to blocking the effect of estrogen

or lowering estrogen levels are used to treat hormone receptor-positive breast cancers. Hormone therapy does not help patients whose tumors are both ER- and PR-negative.

Tamoxifen and toremifene (Fareston®): These anti-estrogen drugs work by temporarily blocking estrogen receptors on breast cancer cells, preventing estrogen from binding to them. They are taken daily as a pill.

For women with hormone receptor-positive cancers, taking tamoxifen after surgery for 5 years reduces the chances of the cancer coming back by about half. Tamoxifen can also be used to treat metastatic breast cancer, as well as to reduce the risk of developing breast cancer in women at high risk. Toremifene works like tamoxifen, but is not used as often.

The most common side effects of these drugs include fatigue, hot flashes, vaginal dryness or discharge, and mood swings.

Some patients whose cancer has spread to their bones may experience a "tumor flare" with pain and swelling in the muscles and bones. This usually subsides quickly, but in some cases the patient may also develop a high calcium level in the blood that cannot be controlled. If this occurs, the treatment may need to be stopped.

Rare, but more serious side effects are also possible. These drugs can increase the risk of developing cancers of the uterus (endometrial cancer and uterine sarcoma). Tell your doctor right away about any unusual vaginal bleeding (a common symptom of both of these cancers). Most uterine bleeding is not from cancer, but this symptom always needs prompt attention.

Another possible serious side effect is blood clots, which usually form in the legs. In some cases, these may lead to a heart attack, stroke, or blockage in the lungs (pulmonary embolism). Call your doctor or nurse right away if you develop pain, redness, or swelling in your lower leg (calf), shortness of breath, chest pain, sudden severe headache, confusion, or trouble speaking or moving.

Depending on a woman's menopausal status, tamoxifen can have different effects on the bones. In pre-menopausal women tamoxifen can cause some bone thinning, but in post-menopausal women it is often good for bone strength. The effects of toremifene on the bones are less clear.

For most women with breast cancer, the benefits of taking these drugs outweigh the risks.

Fulvestrant (Faslodex®): Fulvestrant is a drug that also acts on the estrogen receptor, but instead of blocking it, this drug eliminates it. It is often effective even if the breast cancer is no longer responding to tamoxifen. It is given by injection once a month. Hot flashes, mild nausea, and fatigue are the major side effects. It is currently only approved for use in post-menopausal women with advanced breast cancer that no longer responds to tamoxifen or toremifene.

Aromatase inhibitors (AIs): Three drugs that stop estrogen production in post-menopausal women have been approved to treat both early and advanced breast cancer: letrozole (Femara®), anastrozole (Arimidex®), and exemestane (Aromasin®). They work by blocking an enzyme (aromatase) responsible for making small amounts of estrogen in

post-menopausal women. They cannot stop the ovaries of pre-menopausal women from making estrogen, so they are only effective in post-menopausal women. These drugs are taken daily as pills.

Several studies have compared these drugs with tamoxifen as adjuvant hormone therapy in post-menopausal women. Using these drugs, either alone or after tamoxifen, has been shown to better reduce the risk of cancer recurrence than using tamoxifen alone for 5 years. Schedules that are known to be helpful include:

- Tamoxifen for 2 to 3 years, followed by an aromatase inhibitor (AI) to complete 5 years of treatment
- Tamoxifen for 5 years, followed by an AI for 5 years
- An AI for 5 years

For post-menopausal women whose cancers are hormone receptor–positive, most doctors now recommend using an AI at some point during adjuvant therapy. But it's not yet clear if starting adjuvant therapy with one of these drugs is better than giving tamoxifen and then switching to an AI. We still don't know if giving these drugs for more than 5 years is more helpful than stopping at 5 years. It is also not known if any one of these drugs is better than the others. Studies now being done should help answer these questions.

The AIs tend to have fewer serious side effects than tamoxifen -- they don't cause uterine cancers and very rarely cause blood clots. They can, however, cause muscle pain and joint stiffness and/or pain. The joint pain may be similar to a new feeling of having arthritis in many different joints at one time. This side effect may improve by switching to a different AI, but it has led some women to stop drug treatment. If this occurs, most doctors recommend using tamoxifen to complete 5 years of hormone treatment.

Because aromatase inhibitors remove all estrogens from women after menopause, they also cause bone thinning, sometimes leading to osteoporosis and even fractures. Many women treated with an aromatase inhibitor are also treated with medicine to strengthen their bones, such as bisphosphonates.

Ovarian ablation: In pre-menopausal women, removing or shutting down the ovaries, which are the main source of estrogens, effectively makes the woman post-menopausal. This may allow some other hormone therapies to work better.

Permanent ovarian ablation can be done by surgically removing the ovaries. This operation is called an oophorectomy. More often, ovarian ablation is done with drugs called luteinizing hormone-releasing hormone (LHRH) analogs, such as goserelin (Zoladex®) or leuprolide (Lupron®). These drugs stop the signal that the body sends to ovaries to make estrogens. They can be used alone or with tamoxifen as hormone therapy in pre-menopausal women. They are also being studied as adjuvant therapies along with aromatase inhibitors in pre-menopausal women.

Chemotherapy drugs may also damage the ovaries of pre-menopausal women so they no longer produce estrogen. In some women ovarian function returns months or years later, but in others, the damage to the ovaries is permanent and leads to menopause. This can

sometimes be a helpful (if unintended) consequence of chemotherapy with regard to breast cancer treatment, although it leaves the woman infertile.

All of these methods can cause a woman to have symptoms of menopause, including hot flashes, night sweats, vaginal dryness, and mood swings.

Megestrol acetate: Megestrol acetate (Megace®) is a progesterone-like drug used as a hormone treatment of advanced breast cancer, usually for women whose cancers do not respond to the other hormone treatments. Its major side effect is weight gain, and it is sometimes used in higher doses to reverse weight loss in patients with advanced cancer. This is an older drug that is no longer used very often.

Other ways to control hormones: Androgens (male hormones) may be considered after other hormone treatments for advanced breast cancer have been tried. They are sometimes effective, but they can cause masculine characteristics such as an increase in body hair and a deeper voice to develop.

Targeted therapy

As researchers have learned more about the gene changes in cells that cause cancer, they have been able to develop newer drugs that specifically target these changes. These targeted drugs work differently from standard chemotherapy drugs. They often have different (and less severe) side effects. They are most often used along with chemotherapy at this time.

Drugs that target the HER2/neu protein

Trastuzumab (Herceptin): Trastuzumab is a type of drug known as a monoclonal antibody -- a man-made version of a very specific immune system protein. It attaches to a growth-promoting protein known as HER2/neu (or just HER2), which is present in larger than normal amounts on the surface of the breast cancer cells in about 1 of 5 patients. Breast cancers with too much of this protein tend to grow and spread more aggressively. Trastuzumab can help slow this growth and may also stimulate the immune system to more effectively attack the cancer.

Trastuzumab is given as an injection into a vein (IV), usually once a week or as a larger dose every 3 weeks. The optimal length of time to give it is not yet known.

Trastuzumab is often used (along with chemotherapy) as adjuvant therapy for HER2-positive cancers to reduce the risk of recurrence when the tumor is larger than 1 cm across or when the cancer has spread to the lymph nodes. It is given along with chemotherapy for 3 to 6 months, and then given on its own, usually for a total of a year of treatment. There are ongoing studies looking at how long this drug needs to be given.

Trastuzumab can also shrink some HER2-positive advanced breast cancers that return after chemotherapy or continue to grow during chemotherapy. Treatment that combines trastuzumab with chemotherapy may work better than chemotherapy alone in some patients.

Compared with chemotherapy drugs, the side effects of trastuzumab are relatively mild. They may include fever and chills, weakness, nausea, vomiting, cough, diarrhea, and headache. These side effects occur less often after the first dose.

A more serious potential side effect is heart damage leading to a problem called congestive heart failure. For most (but not all) women, this effect has been temporary and has improved when the drug is stopped. The risk of heart problems is higher when trastuzumab is given with certain chemotherapy drugs such as doxorubicin (Adriamycin) and epirubicin (Ellence). Major symptoms of congestive heart failure are shortness of breath, leg swelling, and severe fatigue. Women having these symptoms should call their doctor right away.

Lapatinib (Tykerb): Lapatinib is another drug that targets the HER2 protein. This drug is given as a pill to women with advanced HER2-positive breast cancer that is no longer helped by chemotherapy and trastuzumab. It is also being studied as an adjuvant therapy in HER2-positive patients, but at this time is only used for advanced breast cancer. In advanced breast cancer, giving lapatinib along with trastuzumab helped patients live longer than giving it alone. The chemotherapy drug capecitabine (Xeloda) is often given as well.

The most common side effects of this drug include diarrhea, nausea, vomiting, rash, and hand-foot syndrome. Diarrhea is a common side effect and can be severe, so it is very important to let your health care team know about any changes in bowel habits as soon as they happen.

In rare cases lapatinib may cause liver problems or a decrease in heart function (that can lead to shortness of breath), although this seems to go away once treatment is finished.

Drugs that target new tumor blood vessels (angiogenesis)

Tumors need to develop and maintain new blood vessels in order to grow. Drugs that target these blood vessels are proving to be helpful against a variety of cancers, including breast cancer.

Bevacizumab (Avastin®) is a monoclonal antibody that has been used in patients with metastatic breast cancer. This antibody is directed against vascular endothelial growth factor, a protein that helps tumors form new blood vessels.

Bevacizumab is given by intravenous (IV) infusion. It is most often used in combination with the chemotherapy drug paclitaxel (Taxol).

Rare, but possibly serious side effects include bleeding, holes forming in the colon (requiring surgery to correct), and slow wound healing.

More common side effects include high blood pressure, tiredness, blood clots, low white blood cell counts, headaches, mouth sores, loss of appetite, and diarrhea. High blood pressure is very common, so it very important that your doctor watches your blood pressure carefully during treatment.

Bevacizumab was first approved by the Food and Drug Administration (FDA) as part of the treatment for metastatic breast cancer in 2008. The approval was based on a study in which the women that received bevacizumab with chemo had a longer time without their cancers growing than the women who received chemo alone. New study results that were presented at a July 2010 FDA meeting did not show a real benefit for the women receiving bevacizumab as a part of their treatment. Although bevacizumab seemed to slow cancer growth for a short-time in some of the women, it didn't help them live longer. Those given bevacizumab also had much more severe side effects. The FDA concluded that in the treatment of metastatic breast cancer, the risks of this drug outweigh the benefits. On December 16, 2010, the FDA announced its plan to remove the breast cancer "indication" for bevacizumab. This would not cause the drug to be removed from the market or become unavailable. It would mean that the company making bevacizumab couldn't market the drug for breast cancer - the company couldn't tell doctors or patients that the drug is useful in treating breast cancer. At this time, women who are taking bevacizumab can continue to do so, but they should discuss this treatment with their doctors.

Bisphosphonates

Bisphosphonates are drugs that are used to help strengthen and reduce the risk of fractures in bones that have been weakened by metastatic breast cancer. Examples include pamidronate (Aredia®) and zoledronic acid (Zometa®). They are given intravenously (IV).

Bisphosphonates may also help against bone thinning (osteoporosis) that can result from treatment with aromatase inhibitors (see above) or from early menopause as a side effect of chemotherapy. There are a number of medicines, including some oral forms of bisphosphonates, to treat loss of bone strength when it is not caused by cancer spread to the bones.

Bisphosphonates can have side effects, including flu-like symptoms and bone pain. A rare but very distressing side effect of intravenous bisphosphonates is damage (osteonecrosis) in the jaw bones (ONJ). It can be triggered by having a tooth extraction (removal) while getting treated with the bisphosphonate. ONJ often appears as an open sore in the jaw that won't heal. It can lead to loss of teeth or infections of the jaw bone. Doctors don't know why this happens or how to treat it, other than to stop the bisphosphonates. Maintaining good oral hygiene by flossing, brushing, making sure that dentures fit properly, and having regular dental checkups may help prevent this. Most doctors recommend that patients have a dental checkup and have any tooth or jaw problems treated before they start taking a bisphosphonate.

High-dose chemotherapy with stem cell transplant

It is possible to use very high doses of chemotherapy or radiation to kill cancer cells, but such treatments also kill the blood-making stem cells in the bone marrow. Damage to these cells lowers a person's blood cell count. Too few white blood cells can lead to

severe infections that could be fatal. Too few platelets make people bleed easily. This, too, can be fatal.

One way to get around this is to remove some of the patient's stem cells from either the peripheral (circulating) blood or bone marrow, give the high-dose treatment, and then return the stem cells into the body through a blood transfusion. The stem cells are able to find their way back into the bone marrow, where they soon re-establish themselves and restore the body's ability to make new blood cells.

At one time it was thought that this would be a good way to treat women with advanced breast cancer. However, several studies have found that women who receive high-dose chemotherapy do not live any longer than women who receive standard chemotherapy without a stem cell transplant. High-dose chemotherapy with stem cell transplant also causes more serious side effects than standard dose chemotherapy.

Research is still being done in this area. New studies may show a benefit, it is likely to be small, and the toxicity from this treatment is very high. At this time, most experts recommend that women with breast cancer not receive high-dose chemotherapy, except as part of a clinical trial.

Clinical trials

You may have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is choosing which treatment is best for you. You may have heard about clinical trials being done for your type of cancer. Or maybe someone on your health care team has mentioned a clinical trial to you.

Clinical trials are carefully controlled research studies that are done with patients who volunteer for them. They are done to get a closer look at promising new treatments or procedures.

If you would like to take part in a clinical trial, you should start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service for a list of clinical trials that meet your medical needs. You can reach this service at 1-800-303-5691 or on our Web site at www.cancer.org/clinicaltrials. You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service toll-free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at www.cancer.gov/clinicaltrials.

There are requirements you must meet to take part in any clinical trial. If you do qualify for a clinical trial, you decide whether or not to enter (enroll in) it.

Clinical trials are one way to get state-of-the art cancer treatment. They are the only way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

You can get a lot more information on clinical trials in our document called *Clinical Trials: What You Need to Know*. You can read it on our Web site or call our toll-free number (1-800-227-2345) and have it sent to you.

Complementary and alternative therapies

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that your doctor hasn't mentioned. Everyone from friends and family to Internet groups and Web sites offer ideas for what might help you. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

What exactly are complementary and alternative therapies?

Not everyone uses these terms the same way, and they are used to refer to many different methods, so it can be confusing. We use *complementary* to refer to treatments that are used *along with* your regular medical care. *Alternative* treatments are used *instead of* a doctor's medical treatment.

Complementary methods: Most complementary treatment methods are not offered as cures for cancer. Mainly, they are used to help you feel better. Some methods that are used along with regular treatment are meditation to reduce stress, acupuncture to help relieve pain, or peppermint tea to relieve nausea. Some complementary methods are known to help, while others have not been tested. Some have been proven not be helpful, and a few have even been found harmful.

Alternative treatments: Alternative treatments may be offered as cancer cures. These treatments have not been proven safe and effective in clinical trials. Some of these methods may pose danger, or have life-threatening side effects. But the biggest danger in most cases is that you may lose the chance to be helped by standard medical treatment. Delays or interruptions in your medical treatments may give the cancer more time to grow and make it less likely that treatment will help.

Finding out more

It is easy to see why people with cancer think about alternative methods. You want to do all you can to fight the cancer, and the idea of a treatment with no side effects sounds great. Sometimes medical treatments like chemotherapy can be hard to take, or they may no longer be working. But the truth is that most of these alternative methods have not been tested and proven to work in treating cancer.

As you consider your options, here are 3 important steps you can take:

- Look for "red flags" that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a "secret" that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking about using.
- Contact us at 1-800-227-2345 to learn more about complementary and alternative methods in general and to find out about the specific methods you are looking at.

The choice is yours

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

Treatment of stage 0 (non-invasive) breast cancer

The 2 types of non-invasive breast cancers, lobular carcinoma in situ (LCIS) and ductal carcinoma in situ (DCIS), are treated very differently.

LCIS: Since this is not a true cancer, no immediate or active treatment is recommended for most women with LCIS. But because having LCIS increases your risk of developing invasive cancer later on, close follow-up is very important. This usually includes a yearly mammogram and a clinical breast exam. Close follow-up of both breasts is important because women with LCIS in one breast have the same increased risk of developing cancer in either breast. Although there is not enough evidence to recommend routine use of magnetic resonance imaging (MRI) in addition to mammograms for women with LCIS, it is reasonable for these women to talk with their doctors about the benefits and limits of being screened yearly with MRI..

Women with LCIS may also want to consider taking tamoxifen or raloxifene to reduce their risk of breast cancer or taking part in a clinical trial for breast cancer prevention. For more information on drugs to reduce breast cancer risk see our document, *Medicines to Reduce Breast Cancer Risk*. They may also wish to discuss other possible prevention strategies (such as reaching an optimal body weight or starting an exercise program) with their doctor.

Some women with LCIS choose to have a bilateral simple mastectomy (removal of both breasts but not axillary lymph nodes) to reduce their risk of breast cancer, especially if they have other risk factors, such as a strong family history. Depending on the woman's preference, she may consider immediate or delayed breast reconstruction.

DCIS: In most cases, a woman with DCIS can choose between breast-conserving therapy (lumpectomy, usually followed by radiation therapy) and simple mastectomy. Lymph node removal (axillary dissection) is usually not needed. Lumpectomy without radiation therapy is only an option for certain women who had small areas of low-grade DCIS that was removed with large enough cancer-free surgical margins. But most women who have a lumpectomy, will require radiation therapy.

Mastectomy may be necessary if the area of DCIS is very large, if the breast has several areas of DCIS, or if lumpectomy cannot completely remove the DCIS (that is, the lumpectomy specimen and re-excision specimens have cancer cells in the surgical margins). Women having a mastectomy for DCIS may have reconstruction immediately or later.

If the DCIS is estrogen receptor-positive, treatment with tamoxifen for 5 years after surgery can lower the risk of another DCIS or invasive cancer developing in either breast. Women may want to discuss the pros and cons of this option with their doctors.

Treatment of invasive breast cancer, by stage

Breast-conserving surgery is often appropriate for earlier-stage invasive breast cancers if the cancer is small enough, although mastectomy is also an option. If the cancer is too large, a mastectomy will be needed, unless pre-operative (neoadjuvant) chemotherapy can shrink the tumor enough to allow breast-conserving surgery. In either case, the lymph nodes will need to be checked and removed if they contain cancer. Radiation will be needed for almost all patients who have breast-conserving surgery and some who have mastectomy. Adjuvant systemic therapy after surgery is typically recommended for all cancers larger than 1 cm (about 1/2 inch) across and for some that are smaller.

Stage I

These cancers are still relatively small and have not spread to the lymph nodes or elsewhere.

Local therapy: Stage I cancers can be treated with either breast-conserving surgery (lumpectomy, partial mastectomy) or modified radical mastectomy. The lymph nodes will also need to be evaluated, with a sentinel lymph node biopsy or an axillary lymph node dissection. Breast reconstruction can be done either at the same time as surgery or later.

Radiation therapy is usually given after breast-conserving surgery. Women may consider breast-conserving surgery *without* radiation therapy if all of the following are true:

- They are age 70 years or older.
- The tumor was 2 cm or less across and it has been completely removed.
- The tumor contains hormone receptors and hormone therapy is given.
- None of the lymph nodes that were removed contained cancer.

Some women who do not meet these criteria may be tempted to avoid radiation, but studies have shown that not getting radiation increases the chances of the cancer coming back.

Adjuvant systemic therapy: Most doctors will discuss the pros and cons of adjuvant hormone therapy (either tamoxifen or an aromatase inhibitor) with all women who have a hormone receptor–positive (estrogen or progesterone) breast cancer, no matter how small the tumor. Women with tumors larger than 0.5 cm (about 1/4 inch) across may be more likely to benefit from it.

If the tumor is smaller than 1 cm (about 1/2 inch) across, adjuvant chemotherapy (chemo) is not usually offered. Some doctors may suggest chemo if a cancer smaller than 1 cm has any unfavorable features (such as being high-grade, hormone receptor–negative, HER2-

positive, or having a high score on one of the gene panels). Adjuvant chemotherapy is usually recommended for larger tumors.

For HER2-positive cancers, adjuvant trastuzumab (Herceptin) is usually recommended as well.

See below for more information on adjuvant therapy.

Stage II

These cancers are larger and/or have spread to a few nearby lymph nodes.

Local therapy: Surgery and radiation therapy options for stage II tumors are similar to those for stage I tumors, except that in stage II, radiation therapy may be considered even after mastectomy if the tumor is large (more than 5 cm across) or the cancer cells are found in several lymph nodes.

Adjuvant systemic therapy: Adjuvant systemic therapy is recommended for women with stage II breast cancer. It may involve hormone therapy, chemotherapy, trastuzumab, or some combination of these, depending on the patient's age, estrogen-receptor status, and HER2/neu status. See the following section for more information on adjuvant therapy.

Neoadjuvant therapy: An option for some women who would like to have breast-conserving therapy for tumors larger than 2 cm (about 4/5 inch across) is to have neoadjuvant (before surgery) chemotherapy, hormone therapy, and/or trastuzumab to shrink the tumor.

If the neoadjuvant treatment shrinks the tumor enough, women may then be able to have breast-conserving surgery (such as lumpectomy) followed by radiation therapy, as well as hormone therapy if the tumor is hormone receptor-positive. Further chemotherapy may also be considered. If the tumor does not shrink enough for breast-conserving surgery, then mastectomy may be required. This may be followed by different chemotherapy. Radiation therapy may be needed if the tumor is large (more than 2 inches across) or if lymph nodes contain cancer. The radiation is usually given after surgery. Also, hormone therapy may be given if the tumor is hormone receptor–positive. Hormone therapy can be given both before and after surgery. A woman's chance for survival from breast cancer does not seem to be affected by whether she gets her chemotherapy before or after her breast surgery.

Stage III

Local treatment for some stage IIIA breast cancers is largely the same as that for stage II breast cancers. They may be removed by breast-conserving surgery (such as lumpectomy) followed by radiation therapy, or by modified radical mastectomy (with or without breast reconstruction). Sentinel lymph node biopsy or axillary lymph node dissection is also done. Radiation therapy may be used after mastectomy if the tumor is large (more than 5 cm across) or is found to have spread to several lymph nodes.

Neoadjuvant therapy may be an option for some women who would like to have breast-conserving therapy.

Surgery is usually followed by adjuvant systemic chemotherapy, and/or hormone therapy, and/or trastuzumab.

Stage III cancers are often treated with neo adjuvant chemo (chemotherapy before surgery). Then a mastectomy is done, usually with removal of the axillary lymph nodes (an axillary lymph node dissection). Reconstruction may be done as well. Breast-conserving surgery may be an option for some women. Surgery is followed by radiation therapy, even if a mastectomy is done. Adjuvant chemotherapy may also be given, and adjuvant hormone therapy is offered to all women with hormone receptor–positive breast cancers.

Adjuvant therapy for stages I to III breast cancer

Adjuvant drug therapy may be recommended, based on the tumor's size, spread to lymph nodes, and other prognostic features. If it is, you may get chemotherapy, trastuzumab (Herceptin), hormone therapy, or some combination of these.

Hormone therapy: Hormone therapy is not likely to be effective for women with hormone receptor-negative tumors. Hormone therapy is frequently offered to all women with hormone receptor–positive invasive breast cancer regardless of the size of the tumor or the number of lymph nodes involved.

Women who are still having periods and have hormone receptor–positive tumors can be treated with tamoxifen, which blocks the effects of estrogen being made by the ovaries. Some doctors also give a luteinizing hormone-releasing hormone (LHRH) analog, which makes the ovaries temporarily stop functioning. Another (permanent) option is surgical removal of the ovaries (oophorectomy). If the woman becomes post-menopausal within 5 years of starting tamoxifen (either naturally or because her ovaries are removed), she may be switched from tamoxifen to an aromatase inhibitor.

Sometimes a woman will stop having periods after chemotherapy or while on tamoxifen. But this does not necessarily mean she is truly post-menopausal. The woman's doctor can do blood tests for certain hormones to determine her menopausal status. This is important because the aromatase inhibitors will only benefit post-menopausal women.

Women no longer having periods, or who are known to be in menopause at any age, and who have hormone receptor–positive tumors will generally get adjuvant hormone therapy either with an aromatase inhibitor (typically for 5 years), or with tamoxifen for a few years followed by an aromatase inhibitor for a few more. For women who can't take aromatase inhibitors, an alternative is tamoxifen for 5 years.

As mentioned before, there are still many unanswered questions about the best way to use these drugs. For example, it's not clear if starting adjuvant therapy with one of these drugs is better than giving tamoxifen for some length of time and then switching to an aromatase inhibitor. Nor has the optimal length of treatment with aromatase inhibitors

been determined. Studies now under way should help answer these questions. You might want to discuss these newer treatments with your doctor.

If chemotherapy is to be given as well as a general rule, hormone therapy is started after chemotherapy is completed.

Chemotherapy: Chemotherapy is usually recommended for all women with an invasive breast cancer whose tumor is hormone receptor-negative, and for women with hormone receptor-positive–tumors who may get additional benefit from having chemotherapy along with their hormone therapy, based on the stage and characteristics of their tumor.

Adjuvant chemotherapy can decrease the risk of the cancer coming back, but it does not remove the risk completely. Before deciding if it's right for you, it is important to understand the chance of your cancer returning and how much adjuvant therapy will decrease that risk.

The specific drug regimens and the length of treatment are often determined by the stage and grade of the cancer. The typical chemotherapy regimens are listed in the chemotherapy section. The length of these regimens usually ranges from 4 to 6 months. In some cases, dose dense chemotherapy may be used.

Trastuzumab (Herceptin): Women who have HER2-positive cancers are usually given trastuzumab along with chemotherapy as part of their treatment.

A common chemotherapy regimen is doxorubicin (Adriamycin) and cyclophosphamide together for about 3 months, followed by paclitaxel (Taxol) and trastuzumab. The paclitaxel is given for about 3 months, while the trastuzumab is given for about 1 year.

A concern among doctors is that giving the trastuzumab so soon after doxorubicin may lead to heart problems, so heart function is watched closely during treatment with tests such as echocardiograms.

To try to lessen the possible effects on the heart, doctors are also looking for effective chemotherapy combinations that don't contain doxorubicin. One such regimen is called *TCH.* It uses the chemotherapy drugs docetaxel (Taxotere) and carboplatin given every 3 weeks along with weekly trastuzumab (Herceptin) for 6 cycles. This is followed by trastuzumab every 3 weeks for a year.

Aids for adjuvant therapy decision making: Some doctors may use newer gene pattern tests to help decide whether to give adjuvant chemotherapy to women with certain stage I or II breast cancers. Examples of such tests include Oncotype DX® and MammaPrint®, which are described in more detail in the section "How is breast cancer diagnosed?" These tests are done on a sample of your breast cancer tissue. They look at the function of several genes within the cancer to help predict the risk of it returning after treatment. The tests will not tell your doctor which is the best hormone therapy or chemotherapy to recommend. Clinical trials are now being done to see if these tests can really tell which women can do without adjuvant chemotherapy in situations where doctors are often uncertain, such as in women with small tumors and uninvolved lymph nodes.

For help in deciding if adjuvant therapy is right for you, you might want to visit the Mayo Clinic Web site at www.mayoclinic.com and type "adjuvant therapy for breast cancer" into the search box. You will find a page that will help you to understand the possible benefits and limits of adjuvant therapy.

Other online guides, such as www.adjuvantonline.com, are designed to be used by health care professionals. This Web site provides information about your risk of the cancer returning within the next 10 years and what benefits you might expect from hormone therapy and/or chemotherapy. You may want to ask your doctor if he or she uses this site.

Stage IV

Stage IV cancers have spread beyond the breast and lymph nodes to other parts of the body. Although surgery and/or radiation may be useful in some situations (see below), they are very unlikely to cure these cancers, so systemic therapy is the main treatment. Depending on many factors, this may consist of hormone therapy, chemotherapy, targeted therapies like trastuzumab (Herceptin) or lapatinib (Tykerb), or some combination of these treatments.

Trastuzumab may help women with HER2-positive cancers live longer if it is given with the first chemotherapy for stage IV disease. It is not yet known whether it also should be given at the same time as hormone therapy, or how long a woman should remain on therapy.

All of the systemic therapies given for breast cancer -- hormone therapy, chemotherapy, and the newer targeted therapies -- have potential side effects, which were described in previous sections. Your doctor will explain to you the benefits and risks of these treatments before prescribing them.

Radiation therapy and/or surgery may also be used in certain situations, such as to treat a small number of metastases in a certain area, to prevent bone fractures or blockage in the liver, or to provide relief of pain or other symptoms. If your doctor recommends such local treatments, it is important that you understand their goal -- whether it is to try to cure the cancer or to prevent or treat symptoms.

In some cases, regional chemotherapy (where drugs are delivered directly into a certain area, such as the fluid around the brain) may be useful as well.

Treatment to relieve symptoms depends on where the cancer has spread. For example, pain from bone metastases may be treated with external beam radiation therapy and/or bisphosphonates such as pamidronate (Aredia) or zoledronic acid (Zometa). Most doctors recommend bisphosphonates (along with calcium and vitamin D) for all patients whose breast cancer has spread to their bones. (For more information about treatment of bone metastases, see our document, *Bone Metastasis*.)

Advanced cancer that progresses during treatment: Treatment for advanced breast cancer can often shrink or slow the growth of the cancer (often for many years), but it may stop working after a time. Further treatment at this point depends on several factors,

including previous treatments, where the cancer is located, and a woman's age, general health, and desire to continue getting treatment.

For hormone receptor–positive cancers that were being treated with hormone therapy, switching to another type of hormone therapy is sometimes helpful. If not, chemotherapy is usually the next step.

For cancers that are no longer responding to one chemotherapy regimen, trying another may be helpful. There are many different drugs and combinations that can be used to treat breast cancer. However, each time a cancer progresses during treatment it becomes less likely that further treatment will have an effect.

HER2-positive cancers that no longer respond to trastuzumab may respond to lapatinib (Tykerb), another drug that attacks the HER2 protein. This drug is usually given along with the chemotherapy drug capecitabine (Xeloda). Both of these drugs are taken as pills.

Because current treatments are very unlikely to cure advanced breast cancer, patients in otherwise good health are encouraged to think about taking part in clinical trials of other promising treatments.

Recurrent breast cancer

Cancer is called recurrent when it come backs after treatment. Recurrence can be local (in the same breast or near the mastectomy scar) or in a distant area. Cancer that is found in the opposite breast is not a recurrence -- it is a new cancer that requires its own treatment.

Local recurrence: Treatment of women whose breast cancer has recurred locally depends on their initial treatment. If the woman had breast-conserving therapy, local recurrence in the breast is usually treated with mastectomy. If the initial treatment was mastectomy, recurrence near the mastectomy site is treated by removing the tumor whenever possible. This is followed by radiation therapy, but only if none had been given after the original surgery. (Radiation can't be given to the same area twice.) In either case, hormone therapy, trastuzumab, chemotherapy, or some combination of these may be used after surgery and/or radiation therapy.

Distant recurrence: In general, women who have a recurrence involving organs like the bones, lungs, brain, etc., are treated the same way as those found to have stage IV breast cancer in these organs when they were first diagnosed (see treatment for stage IV). The only difference is that treatment may be affected by previous treatments a woman has had.

Should your cancer come back, our document, *When Your Cancer Comes Back: Cancer Recurrence* can provide you with more general information on how to manage and cope with this phase of your treatment.

Treatment of breast cancer during pregnancy

Breast cancer is diagnosed in about 1 pregnant woman out of 3,000. In general, treatment recommendations depend upon how long the woman has been pregnant.

Radiation therapy during pregnancy is known to increase the risk of birth defects, so it is not recommended for pregnant women with breast cancer. For this reason, breast-conserving therapy (lumpectomy and radiation therapy) is only an option if treatment can wait until it is safe to deliver the baby. But breast biopsy procedures and even modified radical mastectomy are safe for the mother and fetus.

For a long time it was assumed that chemotherapy was dangerous to the fetus. But several recent studies have found that using certain chemotherapy drugs during the second and third trimesters (the fourth to ninth months) does not increase the risk of birth defects. Because of concern about the potential damage to the fetus, the safety of chemotherapy during the first trimester (the first 3 months) of pregnancy has not been studied.

Hormone therapy may affect the fetus and should not be started until after the patient has given birth.

Many chemotherapy and hormone therapy drugs can enter breast milk and could be passed on to the baby, so breast-feeding is not usually recommended during chemotherapy or hormone therapy.

For more information, see our document, *Pregnancy and Breast Cancer*.

More treatment information

For more details on treatment options -- including some that may not be addressed in this document -- the National Cancer Institute (NCI) and the National Comprehensive Cancer Network (NCCN) are good sources of information.

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site (www.cancer.gov). Detailed guidelines intended for use by cancer care professionals are also available on www.cancer.gov.

The NCCN, made up of experts from many of the nation's leading cancer centers, develops cancer treatment guidelines for doctors to use when treating patients. Those are available on the NCCN Web site (www.nccn.org).

What should you ask your doctor about breast cancer?

It is important for you to have frank, open discussions with your cancer care team. Don't be afraid to ask questions, no matter how minor you might think they are. Some questions to consider:

- What type of breast cancer do I have? How does this affect my treatment options and prognosis?
- Has my cancer spread to lymph nodes or internal organs?

- What is the stage of my cancer and how does it affect my treatment options and outlook?
- Are there other tests that need to be done before we can decide on treatment?
- Should I consider genetic testing?
- Should I think about taking part in a clinical trial?
- What treatments are appropriate for me? What do you recommend? Why?
- What are the risks and side effects that I should expect?
- How effective will breast reconstruction surgery be if I need or want it?
- What are the pros and cons of having it done right away or waiting until later?
- What will my breasts look and feel like after my treatment? Will I have normal sensation in them?
- How long will treatment last? What will it involve? Where will it be done?
- What should I do to get ready for treatment?
- Will I need a blood transfusion?
- Should I follow a special diet or make other lifestyle changes?
- What are the chances my cancer will come back with the treatment programs we have discussed? What would we do if that happens?
- Will I go through menopause as a result of the treatment?
- Will I be able to have children after my treatment?
- What type of follow-up will I need after treatment?

Be sure to write down any questions that occur to you that are not on this list. For instance, you might want specific information about recovery times so that you can plan your work schedule. Or you may want to ask about second opinions. Taking another person and/or a tape recorder to the appointment can be helpful. Collecting copies of your medical records, pathology reports, and radiology reports may be useful in case you wish to seek a second opinion at a later time.

What happens after treatment for breast cancer?

Completing treatment can be both stressful and exciting. You will probably be relieved to finish treatment, yet it is hard not to worry about cancer coming back. (When cancer returns, it is called recurrence.) This is a very common concern among those who have

had cancer. For more information on this please refer to our document, *Living with Uncertainty: The Fear of Cancer Recurrence*.

It may take a while before your confidence in your own recovery begins to feel real and your fears are somewhat relieved. Even with no recurrences, people who have had cancer learn to live with uncertainty.

Follow-up care

After treatment is completed, it is very important to go to all scheduled follow-up appointments. During these visits, your doctors will ask questions about any symptoms and may do physical exams and order lab tests or imaging tests as needed to look for recurrences or side effects. Almost any cancer treatment can have side effects. Some may last for a few weeks to several months, but others can be permanent. You should never hesitate to tell your doctor or other members of your cancer care team about any symptoms or side effects that concern you.

At first, your follow-up appointments will probably be scheduled for every 3 to 6 months. The longer you have been free of cancer, the less often the appointments are needed. After 5 years, they are typically done about once a year. If you had breast-conserving surgery, you will need to continue to have mammograms every year.

If you are taking tamoxifen, you should have yearly pelvic exams because this drug can increase your risk of uterine cancer. Be sure to tell your doctor right away about any abnormal vaginal bleeding you are having. Although this is usually caused by a non-cancerous condition, it may also be the first sign of uterine cancer.

If you are taking an aromatase inhibitor, you may be at increased risk for thinning of the bones. Your doctor will want to monitor your bone health and may consider testing your bone density.

Other tests such as blood tumor marker studies, blood tests of liver function, bone scans, and chest x-rays are not usually needed unless symptoms or physical exam findings suggest it is likely the cancer has recurred. These and other tests may be done as part of evaluating new treatments by clinical trials.

If exams and tests suggest a recurrence, imaging tests such as an x-ray, CT scan, PET scan, MRI scan, bone scan, and/or a biopsy may be done. Your doctor may also measure levels of blood tumor markers such as CA-15-3, CA 27-29, or CEA. The blood levels of these substances go up in some women if their cancer has spread to bones or other organs such as the liver. They are not elevated in all women with recurrence, so they aren't always helpful. If they are elevated, they may help your doctor monitor the results of therapy.

If cancer does recur, the treatment will depend on the location of the cancer and what treatments you've had before. It may involve surgery, radiation therapy, hormone therapy, chemotherapy, targeted therapy, or some combination of these. For more information on how recurrent cancer is treated, see the section, "How is breast cancer treated?" For more

general information on dealing with a recurrence, you may also want to see our document, *When Your Cancer Comes Back: Cancer Recurrence*.

Lymphedema

Lymphedema, or swelling of the arm from buildup of fluid, may occur any time after treatment for breast cancer. Any treatment that involves axillary lymph node dissection or radiation to the axillary lymph nodes carries the risk of lymphedema because normal drainage of lymph fluid from the arm is changed.

One of the first symptoms of lymphedema may be a feeling of tightness in the arm or hand on the same side that was treated for breast cancer. Any swelling, tightness, or injury to the arm or hand should be reported promptly to your doctor or nurse.

There is no good way to predict who will and will not develop lymphedema. It can occur right after surgery, or months, or even years later. The possibility of developing lymphedema remains throughout a woman's lifetime.

With care, lymphedema can often be avoided or, if it develops, kept under control. Injury or infection involving the affected arm or hand can contribute to the development of lymphedema or make existing lymphedema worse, so preventive measures should focus on protecting the arm and hand. Most doctors recommend that women avoid having blood drawn from or blood pressures taken on the arm on the side of the lymph node surgery or radiation.

To learn more, see our document, *Lymphedema: What Every Woman with Breast Cancer Should Know*.

Quality of life

Women who have had treatment for breast cancer should be reassured that while they may be left with reminders of their treatment (such as surgical scars), their overall quality of life, once treatment has been completed, can be normal. Extensive studies have shown this. Women who have had chemotherapy may, however, notice a slight decrease in certain areas of function.

Some studies suggest that younger women, who represent about 1 out of 4 breast cancer survivors, tend to have more problems adjusting to the stresses of breast cancer and its treatment. They may have more trouble with emotional and social functioning. Some can feel isolated. For some women, chemotherapy may have caused early menopause, which can be very distressing on its own. There may also be sexual difficulties. These issues may be helped with counseling and support groups directed to younger breast cancer survivors.

Emotional aspects of breast cancer

It is important that your focus on tests and treatments does not prevent you from considering your emotional, psychological, and spiritual health as well. Once your

treatment ends, you may find yourself overwhelmed by emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through your treatment.

Now you may find that you think about the potential of your own death, or the effect of your cancer on your family, friends, and career. You may also begin to re-evaluate your relationship with your spouse or partner. Unexpected issues may also cause concern -- for instance, as you become healthier and have fewer doctor visits, you will see your health care team less often. That can be a source of anxiety for some.

This is an ideal time to seek out emotional and social support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or individual counselors.

Almost everyone who has been through cancer can benefit from getting some type of support. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

The cancer journey can feel very lonely. It is not necessary or realistic to go it all by yourself. And your friends and family may feel shut out if you decide not to include them. Let them in -- and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-227-2345 and we can put you in touch with an appropriate group or resource.

Body image

Along with having to cope with the emotional stress that cancer and its treatment can cause, many women with breast cancer also find themselves dealing with changes in their appearance as a result of their treatment.

Some changes may be short term, such as hair loss. But even short-term changes can have a profound effect on how a woman feels about herself. A number of options are available to help women cope with hair loss, including wigs, hats, scarves, and other accessories. For a list of some companies that sell wigs and other hair accessories, see our document, *Breast Prostheses and Hair Loss Accessories List*. Alternatively, some women may choose to use their baldness as a way to identify themselves as breast cancer survivors.

Other changes that result from breast cancer treatment may be more permanent, like the loss of part or all of a breast (or breasts) after surgery. Some women may choose reconstructive surgery to address this, while others may opt for a breast form.

Regardless of the changes you may experience, it's important to know that there is advice and support out there to help you cope with these changes. Speaking with your doctor or other members of your health care team is often a good starting point. There are also

many support groups available, such as the American Cancer Society's Reach to Recovery program. Call 1-800-227-2345 to learn more about programs in your area.

Breast forms and bras vs. breast reconstruction

Following a mastectomy (or breast-conserving surgery in some cases), a woman may consider having the breast mound rebuilt, or reconstructed. This is usually something that is discussed before surgery to treat the cancer. Decisions about the type of reconstruction and when it will be done depend on each woman's medical situation and personal preferences. There are several types of reconstructive surgery available. Some use saline (salt water) or silicone implants, while others use tissues from other parts of your body.

For a discussion of the different breast reconstruction options, see our document, *Breast Reconstruction After Mastectomy*.

A *breast form* is a prosthesis (artificial body part) worn either inside a bra or attached to the body to simulate the appearance and feel of a natural breast. For women who have had a mastectomy, breast forms can be an important alternative to breast reconstruction. Some women may not want further surgery, knowing that breast reconstruction can sometimes require several procedures to complete.

If you are planning on using a breast form, your doctor will tell you when you have healed enough to be fitted for a permanent breast form or prosthesis. Most of these forms are made from materials that mimic the movement, feel, and weight of natural tissue. A properly weighted form provides the balance your body needs for correct posture and anchors your bra, keeping it from riding up.

At first, these forms may feel too heavy, but in time they will feel natural. Prices vary considerably. High price doesn't necessarily mean that the product is the best for you. Take time to shop for a good fit, comfort, and an attractive, natural appearance in the bra and under clothing. Your clothes should fit the way they did before surgery.

The right bra for you may very well be the one you have always worn. It may or may not need adjustments. If there is tenderness during healing, a bra extender can help by increasing the circumference of the bra so that it does not bind the chest too tightly. Heavy-breasted women can relieve pressure on shoulder straps by slipping a bra shoulder pad under one or both straps.

If you decide to wear your breast form in a pocket in your bra, you can have your regular bra adapted. There are also special mastectomy bras with the pockets already sewn in. If the breast form causes any kind of skin irritation, use a bra with a pocket. If your bra has underwires, you may be able to wear it, but be sure to clear this with your doctor.

You might want to wear your prosthesis under nightgowns but would like something more comfortable than a regular bra. Most department stores carry a soft bra, sometimes called a leisure or night bra.

For a list of companies that sell breast prostheses and other accessories, see our document, *Breast Prostheses and Hair Loss Accessories List.*

Insurance coverage of breast prostheses can vary. Be sure to read your insurance policy to see what is covered and how you must submit claims. Also, ask your doctor to write prescriptions for your prosthesis and for any special mastectomy bras. When purchasing bras or breast forms, mark the bills and any checks you write "surgical." Medicare and Medicaid can be used to pay for some of these expenses if you are eligible. The cost of breast forms and bras with pockets may be tax deductible, as may the cost if you have a bra altered. Keep careful records of all related expenses.

Be aware that some insurance companies will not cover both a breast prosthesis and reconstructive surgery. That can mean that if you submit a claim for a prosthesis or bra to your insurance company, in some cases the company **will not** cover reconstruction, should you choose this procedure in the future. Make sure you get all the facts before submitting any insurance claims.

Be sure to call your local ACS Reach to Recovery volunteer about any questions you have. She will give you suggestions, additional reading material, and advice. Remember that she's been there and will probably understand.

Sexuality

Concerns about sexuality are often very worrisome to a woman with breast cancer. Several factors may place a woman at higher risk for sexual problems after breast cancer. Physical changes (such as those after surgery) may make a woman less comfortable with her body. Some treatments for breast cancer, such as chemotherapy, can change a woman's hormone levels and may negatively affect sexual interest and/or response. A diagnosis of breast cancer when a woman is in her 20s or 30s can be especially difficult because choosing a partner and childbearing are often very important during this period.

Suggestions that may help a woman adjust to changes in her body image include looking at and touching herself; seeking the support of others, preferably before surgery; involving her partner as soon as possible after surgery; and openly communicating feelings, needs, and wants created by her changed image.

Sexual impact of surgery and radiation

The most common sexual side effects stem from damage to a woman's feelings of attractiveness. In our culture, we are taught to view breasts as a basic part of beauty and femininity. If her breast has been removed, a woman may be insecure about whether her partner will accept her and find her sexually pleasing.

The breasts and nipples are also sources of sexual pleasure for many women. Touching the breasts is a common part of foreplay in our culture. For many women, breast stimulation adds to sexual excitement.

Treatment for breast cancer can interfere with pleasure from breast caressing. After a mastectomy, the whole breast is gone. Some women still enjoy being stroked around the area of the healed scar. Others dislike being touched there and may no longer even enjoy being touched on the remaining breast and nipple. Some women who have had a

mastectomy may feel self-conscious in sex positions where the area of the missing breast is more visible.

Breast surgery or radiation to the breasts does not physically decrease a woman's sexual desire. Nor does it decrease her ability to have vaginal lubrication or normal genital feelings, or to reach orgasm. Some good news from recent research is that within a year after their surgery, most women with early stage breast cancer have good emotional adjustment and sexual satisfaction. They report a quality of life similar to women who never had cancer.

A few women have chronic pain in their chests and shoulders after radical mastectomy. During intercourse, supporting these areas with pillows and avoiding positions where your weight rests on your chest or arms may help.

If surgery removed only the tumor (segmental mastectomy or lumpectomy) and was followed by radiation therapy, the breast may be scarred. It also may be a different shape or size. During radiation therapy, the skin may become red and swollen. The breast also may be a little tender. Feeling in the breast and nipple, however, should return to normal.

Sexual impact of breast reconstruction

Breast reconstruction restores the shape of the breast, but it cannot restore normal breast sensation. The nerve that supplies feeling to the nipple runs through the deep breast tissue, and it gets disconnected during surgery. In a reconstructed breast, the feeling of pleasure from touching the nipple is lost. A rebuilt nipple has much less feeling.

In time, the skin on the reconstructed breast will regain some sensitivity but probably will not give the same kind of pleasure as before mastectomy. Breast reconstruction often makes women more comfortable with their bodies, however, and helps them feel more attractive.

Effect on your partner

Relationship issues are also important because the cancer diagnosis can be very distressing for the partner, as well as the patient. Partners are usually concerned about how to express their love physically and emotionally after treatment, especially surgery. Breast cancer can be a growth experience for couples under certain circumstances. The relationship may be enhanced if the partner takes part in decision making and accompanies the woman to surgery and other treatments.

Pregnancy after breast cancer

Because of the well-established link between estrogen levels and growth of breast cancer cells, many doctors have advised breast cancer survivors not to become pregnant for at least 2 years after treatment. This would allow any early return of the cancer to be diagnosed, which in turn could affect a woman's decision to become pregnant. But this 2-year wait period is not based on strong scientific evidence, and earlier pregnancy may not

be harmful. Although few studies have been done, nearly all have found that pregnancy does not increase the risk of recurrence after successful treatment of breast cancer.

Women are advised to discuss their risk of recurrence with their doctors. In some cases, counseling can help women with the complex issues and uncertainties about motherhood and breast cancer survivorship.

Post-menopausal hormone therapy after breast cancer

The known link between estrogen levels and breast cancer growth has discouraged many women and their doctors from choosing or recommending post-menopausal hormone therapy (PHT), also called hormone replacement therapy (HRT), to help relieve menopausal symptoms. Unfortunately, many women experience menopausal symptoms after treatment for breast cancer. This can occur naturally, as a result of post-menopausal women stopping PHT, or in pre-menopausal women as a result of chemotherapy or ovarian ablation. Tamoxifen can also cause menopausal symptoms such as hot flashes.

In the past, doctors have offered PHT after breast cancer treatment to women suffering from severe symptoms because early studies had shown no harm. But a well-designed clinical trial (the HABITS study) found that breast cancer survivors taking PHT were much more likely to develop a new or recurrent breast cancer than women who were not taking the drugs. This is why most doctors now feel that for women previously treated for breast cancer, taking PHT would be unwise.

Women may want to discuss with their doctors alternatives to PHT to help with specific menopausal symptoms. Some doctors have suggested that phytoestrogens (estrogen-like substances from certain plant sources, such as soy products) may be safer than the estrogens used in PHT. However, there is not enough information available on phytoestrogens to fully evaluate their safety for breast cancer survivors.

Drugs without hormonal properties that may be somewhat effective in treating hot flashes include the antidepressant venlafaxine (Effexor®), the blood pressure drug clonidine, and the nerve drug gabapentin (Neurontin®). Acupuncture also seems to be helpful in treating hot flashes. For women taking tamoxifen, it's important to note that some antidepressants, known as SSRIs, may interact with tamoxifen and make it less effective. Ask your doctor about any possible interactions between tamoxifen and any drugs you may be taking.

Seeing a new doctor

At some point after your cancer diagnosis and treatment, you may find yourself in the office of a new doctor. Your original doctor may have moved or retired, or you may have moved or changed doctors for some reason. It is important that you be able to give your new doctor the exact details of your diagnosis and treatment. Make sure you have the following information handy:

- A copy of your pathology report(s) from any biopsy or surgery
- If you had surgery, a copy of your operative report(s)

- If you were hospitalized, a copy of the discharge summary that doctors must prepare when patients are sent home
- If you had radiation therapy, a copy of your treatment summary
- If you had systemic therapy (hormone therapy, chemotherapy, or targeted therapies), a list of your drugs, drug doses, and when you took them

It is also important to keep medical insurance. Even though no one wants to think of their cancer coming back, it is always a possibility. If it happens, the last thing you want is to have to worry about paying for treatment.

Lifestyle changes to consider during and after treatment

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life -- making healthy choices and feeling as well as possible, physically and emotionally. Having cancer and dealing with treatment can be time-consuming and emotionally draining, but it can also be a time to look at your life in new ways. Maybe you are thinking about how to improve your health over the long term. Some people even begin this process during cancer treatment.

Make healthier choices

Think about your life before you learned you had cancer. Were there things you did that might have made you less healthy? Maybe you drank too much alcohol, or ate more than you needed, or smoked, or didn't exercise very often. Emotionally, maybe you kept your feelings bottled up, or maybe you let stressful situations go on too long.

Now is not the time to feel guilty or to blame yourself. However, you can start making changes today that can have positive effects for the rest of your life. Not only will you feel better but you will also be healthier. What better time than now to take advantage of the motivation you have as a result of going through a life-changing experience like having cancer?

You can start by working on those things that you feel most concerned about. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call 1-800-227-2345.

Diet and nutrition

Eating right can be a challenge for anyone, but it can get even tougher during and after cancer treatment. For instance, treatment often may change your sense of taste. Nausea can be a problem. You may lose your appetite for a while and lose weight when you don't want to. On the other hand, some people gain weight even without eating more. This can be frustrating, too.

If you are losing weight or have taste problems during treatment, do the best you can with eating and remember that these problems usually improve over time. You may want to ask your cancer team for a referral to a dietitian, an expert in nutrition who can give you

ideas on how to fight some of the side effects of your treatment. You may also find it helps to eat small portions every 2 to 3 hours until you feel better and can go back to a more normal schedule.

One of the best things you can do after treatment is to put healthy eating habits into place. You will be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Try to eat 5 or more servings of vegetables and fruits each day. Choose whole grain foods instead of white flour and sugars. Try to limit meats that are high in fat. Cut back on processed meats like hot dogs, bologna, and bacon. Get rid of them altogether if you can. If you drink alcohol, limit yourself to 1 or 2 drinks a day at the most. And don't forget to get some type of regular exercise. The combination of a good diet and regular exercise will help you maintain a healthy weight and keep you feeling more energetic.

Weight

For a woman diagnosed with breast cancer, achieving or maintaining a desirable weight may be one of the most important things you can do. Most studies have found that women who are overweight or obese when they are first diagnosed are more likely to have their disease recur and are more likely to die from breast cancer. Overweight women should be encouraged to lose weight after treatment. In some cases, a modest weight loss program may even be started during treatment, if the doctor approves.

Study results have been mixed as to how strongly weight gain affects breast cancer recurrence or survival. Some studies have found that those who gained significant amounts of weight after diagnosis were more likely to relapse and more likely to die than were women who gained less weight. However, other recent studies have not found that weight gain affected prognosis.

Rest, fatigue, work, and exercise

Fatigue is a very common symptom in people being treated for cancer. This is often not an ordinary type of tiredness but a "bone-weary" exhaustion that doesn't get better with rest. For some, this fatigue lasts a long time after treatment, and can discourage them from physical activity.

However, exercise can actually help you reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel physically and emotionally improved and can cope better.

If you are ill and need to be on bed rest during treatment, it is normal to expect your fitness, endurance, and muscle strength to decline some. Physical therapy can help you maintain strength and range of motion in your muscles, which can help fight fatigue and the sense of depression that sometimes comes with feeling so tired.

Any program of physical activity should fit your own situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old

who plays tennis 3 times a week. If you haven't exercised in a few years but can still get around, you may want to think about taking short walks.

Talk with your health care team before starting, and get their opinion about your exercise plans. Then, try to get an exercise buddy so that you're not doing it alone. Having family or friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, though, you will need to balance activity with rest. It is okay to rest when you need to. It is really hard for some people to allow themselves to do that when they are used to working all day or taking care of a household. Exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- It strengthens your muscles.
- It reduces fatigue.
- It lowers anxiety and depression.
- It makes you feel generally happier.
- It helps you feel better about yourself.

And long term, we know that exercise plays a role in preventing some cancers. The American Cancer Society, in its guidelines on physical activity for cancer prevention, recommends that to reduce the risk for developing breast cancer, women should take part in moderate to vigorous physical activity for 45 to 60 minutes on 5 or more days of the week. Moderate activities are those that take about as much effort as a brisk walk. Vigorous activities use larger muscle groups, make you sweat, and cause a noticeable increase in heart rate and breathing.

The role of physical activity in reducing the risk of breast cancer recurrence is less well-defined, although several recent studies suggest that breast cancer survivors who are physically active may have lower rates of recurrence and death than those who are inactive.

What happens if treatment is no longer working?

If cancer continues to grow after one kind of treatment, or if it returns, it is often possible to try another treatment plan that might still cure the cancer, or at least shrink the tumors enough to help you live longer and feel better. On the other hand, when a person has received several different medical treatments and the cancer has not been cured, over time the cancer tends to become resistant to all treatment. At this time it's important to weigh the possible limited benefit of a new treatment against the possible downsides, including continued doctor visits and treatment side effects.

Everyone has his or her own way of looking at this. Some people may want to focus on remaining comfortable during their limited time left.

This is likely to be the most difficult time in your battle with cancer -- when you have tried everything medically within reason and it's just not working anymore. Your doctor may offer you new treatment, but you need to consider that at some point, continuing treatment is not likely to improve your health or change your prognosis or survival.

If you want to continue treatment to fight your cancer as long as you can, you still need to consider the odds of more treatment having any benefit. In many cases, your doctor can estimate the response rate for the treatment you are considering. Some people are tempted to try more chemotherapy or radiation, for example, even when their doctors say that the odds of benefit are less than 1%. In this situation, you need to think about and understand your reasons for choosing this plan.

No matter what you decide to do, it is important that you be as comfortable as possible. Make sure you are asking for and getting treatment for any symptoms you might have, such as pain. This type of treatment is called *palliative treatment*.

Palliative treatment helps relieve these symptoms, but is not expected to cure the disease; its main purpose is to improve your quality of life. Sometimes, the treatments you get to control your symptoms are similar to the treatments used to treat cancer. For example, radiation therapy might be given to help relieve bone pain from bone metastasis. Or chemotherapy might be given to help shrink a tumor and keep it from causing a bowel obstruction. But this is not the same as receiving treatment to try to cure the cancer.

At some point, you may benefit from hospice care. Most of the time, this is given at home. Your cancer may be causing symptoms or problems that need attention, and hospice focuses on your comfort. You should know that receiving hospice care doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. It just means that the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult stage of your cancer.

Remember also that maintaining hope is important. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends -- times that are filled with happiness and meaning. In a way, pausing at this time in your cancer treatment is an opportunity to refocus on the most important things in your life. This is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do.

What's new in breast cancer research and treatment?

Research into the causes, prevention, and treatment of breast cancer is under way in many medical centers throughout the world.

Causes of breast cancer

Studies continue to uncover lifestyle factors and habits that alter breast cancer risk. Ongoing studies are looking at the effect of exercise, weight gain or loss, and diet on breast cancer risk.

Studies on the best use of genetic testing for BRCA1 and BRCA2 mutations continue at a rapid pace. Scientists are also exploring how common gene variations may affect breast cancer risk. Each gene variant has only a modest effect in risk (10 to 20%), but when taken together they may potentially have a large impact.

Potential causes of breast cancer in the environment have also received more attention in recent years. While much of the science on this topic is still in its earliest stages, this is an area of active research.

A large, long-term study funded by the National Institute of Environmental Health Sciences (NIEHS) is now being done to help find the causes of breast cancer. Known as the Sister Study, it has enrolled 50,000 women who have sisters with breast cancer. This study will follow these women for at least 10 years and collect information about genes, lifestyle, and environmental factors that may cause breast cancer. An offshoot of the Sister Study, the Two Sister Study, is designed to look at possible causes of early onset breast cancer. To find out more about these studies, call 1-877-4-SISTER (1-877-474-7837) or visit the Sister Study Web site (www.sisterstudy.org).

Chemoprevention

Results of several studies suggest that selective estrogen-receptor modulators (SERMs) like tamoxifen and raloxifene may lower breast cancer risk in women with certain breast cancer risk factors. But so far, many women are reluctant to take these medicines because they are concerned about possible side effects.

Newer studies are looking at whether aromatase inhibitors -- drugs such as anastrozole, letrozole, and exemestane -- can reduce the risk of developing breast cancer in post-menopausal women. These drugs are already being used as adjuvant hormone therapy to help prevent breast cancer recurrences, but none of them is approved for reducing breast cancer risk at this time.

Fenretinide, a retinoid, is also being studied as a way to reduce the risk of breast cancer (retinoids are drugs related to vitamin A). In a small study, this drug reduced breast cancer risk as much as tamoxifen. Other drugs are also being studied to reduce the risk of breast cancer.

For more information, see our document, *Medicines to Reduce Breast Cancer Risk.*

New laboratory tests

Gene expression studies

One of the dilemmas with early-stage breast cancer is that doctors cannot always accurately predict which women have a higher risk of cancer coming back after treatment. That is why almost every woman, except for those with small tumors, receives some sort of adjuvant treatment after surgery. To try to better pick out who will need adjuvant therapy, researchers have looked at many aspects of breast cancers.

In recent years, scientists have been able to link certain patterns of genes with more aggressive cancers -- those that tend to come back and spread to distant sites. Some lab tests based on these findings, such as the Oncotype DX and MammaPrint tests, are already available, although doctors are still trying to determine the best way to use them. These tests are explained in the section, "How is breast cancer diagnosed?" Other tests are being developed as well.

Classifying breast cancer

Research on patterns of gene expression has also suggested some newer ways of classifying breast cancers. The current types of breast cancer are based largely on how tumors look under a microscope. A newer classification, based on molecular features, may be better able to predict prognosis and response to several types of breast cancer treatment. The new research suggests there are 4 basic types of breast cancers:

Luminal A and luminal B types: The luminal types are estrogen receptor (ER)–positive, usually low grade, and tend to grow fairly slowly. The gene expression patterns of these cancers are similar to normal cells that line the breast ducts and glands (the lining of a duct or gland is called its lumen). Luminal A cancers have the best prognosis. Luminal B cancers generally grow somewhat faster than the luminal A cancers and their outlook is not quite as good.

HER2 type: These cancers have extra copies of the HER2 gene and several other genes. They usually have a high-grade appearance under the microscope. These cancers tend to grow more quickly and have a worse prognosis, although they often can be treated successfully with targeted therapies such as trastuzumab (Herceptin) and lapatinib (Tykerb).

Basal type: Most of these cancers are of the so-called *triple-negative* type, that is, they lack estrogen or progesterone receptors and have normal amounts of HER2. The gene expression patterns of these cancers are similar to cells in the deeper basal layers of breast ducts and glands. This type is more common among women with BRCA1 gene mutations. For reasons that are not well understood, this cancer is also more common among younger and African-American women.

These are high-grade cancers that tend to grow quickly and have a poor outlook. Hormone therapy and anti-HER2 therapies like trastuzumab and lapatinib are not

effective against these cancers, although chemotherapy can be helpful. A great deal of research is being done to find better ways to treat these cancers.

It is hoped that these new breast cancer classifications might someday allow doctors to better tailor breast cancer treatments, but more research is needed in this area before this is possible.

Tests of HER2 status

Determining a breast cancer's HER2 status is important to get an idea of how aggressive the cancer might be and to find out if certain drugs that target HER2 can be used to treat the disease.

Two types of tests -- immunohistochemistry (IHC) and fluorescence in situ hybridization (FISH) -- are currently used to determine HER2 status. The FISH test is generally thought to be more accurate, but it also requires special equipment, which can make testing more expensive.

A newer type of test, known as chromogenic in situ hybridization (CISH), works similarly to FISH, by using small DNA probes to count the number of HER2 genes in breast cancer cells. But this test looks for color changes (not fluorescence) and doesn't require a special microscope, which may make it less expensive. Unlike other tests, it can be used on tissue samples that have been stored in the lab. Right now, it is not being used as much as IHC or FISH.

Circulating tumor cells

Researchers have found that in many women with breast cancer, cells may break away from the tumor and enter the blood. These circulating tumor cells can be detected with sensitive lab tests. These tests are not yet available for general use, but they may eventually be helpful in determining whether treatment (such as chemotherapy) is working or in detecting cancer recurrence after treatment.

Newer imaging tests

Several newer imaging methods are now being studied for evaluating abnormalities that may be breast cancers.

Scintimammography (molecular breast imaging)

In scintimammography, a slightly radioactive tracer called technetium sestamibi is injected into a vein. The tracer attaches to breast cancer cells and is detected by a special camera.

This is a newer technique that is still being studied to see if it will be useful in finding breast cancers. Some radiologists believe it may helpful in looking at suspicious areas found by regular mammograms, but its exact role remains unclear. Current research is aimed at improving the technology and evaluating its use in specific situations such as in

the dense breasts of younger women. Some early studies have suggested that it may be almost as accurate as more expensive magnetic resonance imaging (MRI) scans. This test, however, will not replace your usual screening mammogram.

Tomosynthesis (3D mammography)

This technology is basically an extension of a digital mammogram. For this test, a woman lies face down on a table with a hole for the breast to hang through, and a machine takes x-rays as it rotates around the breast. Tomosynthesis allows the breast to be viewed as many thin slices, which can be combined into a 3-dimensional picture. It may allow doctors to detect smaller lesions or ones that would otherwise be hidden with standard mammograms. This technology is still considered experimental and is not yet available outside of a clinical trial.

Several other experimental imaging methods, including thermal imaging (thermography) are discussed in our document, *Mammograms and Other Breast Imaging Procedures*.

Treatment

Oncoplastic surgery

Breast-conserving therapy (lumpectomy or partial mastectomy) can often be used for early-stage breast cancers. But in some women, it can result in breasts of different sizes and/or shapes. For larger tumors, it might not even be possible, and a mastectomy might be needed instead. Some doctors address this problem by combining cancer surgery and plastic surgery techniques, known as oncoplastic surgery. This typically involves reshaping the breast at the time of the initial breast-conserving surgery, and may mean operating on the other breast as well to make them more symmetrical. This approach is still fairly new, and not all doctors are comfortable with it.

Breast reconstruction surgery

The number of women with breast cancer choosing breast conservation therapy has been steadily increasing, but there are some women who, for medical or personal reasons, choose mastectomy. Some of them also choose to have reconstructive surgery to restore the breast's appearance.

Technical advances in microvascular surgery (reattaching blood vessels) have made free-flap procedures an option for breast reconstruction. For more information on the types of reconstructive surgery now available, see our document, *Breast Reconstruction After Mastectomy*.

For several years, concern over a possible link between breast implants and immune system diseases has discouraged some women from choosing implants as a method of breast reconstruction. Recent studies have found that although implants can cause some side effects (such as firm or hard scar tissue formation), women with implants do not

have any greater risk for immune system diseases than women who have not had this surgery.

Similarly, the concern that breast implants increase the risk of breast cancer recurrence or formation of new cancers is not supported by current evidence.

Radiation therapy

For women who need radiation after breast-conserving surgery, newer techniques such as hypofractionated radiation or accelerated partial breast irradiation may be as effective while offering a more convenient way to receive it (as opposed to the standard daily radiation treatments that take several weeks to complete). These techniques are described in more detail in the section, "How is breast cancer treated?"

Large studies are being done to determine if these techniques are as effective as standard radiation in helping prevent cancer recurrences.

New chemotherapy drugs

Advanced breast cancers are often hard to treat, so researchers are always looking for newer drugs.

Erubulin (Halaven™) is a new drug for breast cancer that comes from the sea sponge. It works in a way that is similar to the taxanes (like docetaxel/Taxotere and paclitaxel/Taxol). It has been shown to help women with advanced breast cancer who have already been treated with both a taxane and an anthracycline (such as doxorubicin/Adriamycin and epirubicin/Ellence). In a clinical trial, women (who had been previously treated with those drugs) who were given erubulin lived longer than those treated with other chemo drugs. Common side effects of this drug include low blood counts, fatigue (tiredness), hair loss, nausea, and constipation. The drug also can cause nerve damage (neuropathy), leading to problems like numbness, tingling, or even pain in the hands and feet. Erubulin is given as an injection into a vein.

A drug class has been developed that targets cancers caused by BRCA mutations. This class of drugs is called PARP inhibitors and they have shown promise in clinical trials treating breast, ovarian, and prostate cancers that had spread and were resistant to other treatments. Further studies are underway to see if this drug can help patients without BRCA mutations.

Targeted therapies

Targeted therapies are a group of newer drugs that specifically take advantage of gene changes in cells that cause cancer.

Drugs that target HER2: There are 2 drugs approved for use that target excess HER2 protein, trastuzumab (Herceptin) and lapatinib (Tykerb). Studies continue to see which of these is best for treating early breast cancer. Other drugs that target the HER2 protein are

being tested in clinical trials, including TDM-1, pertuzumab and neratinib. Researchers are also looking at using a vaccine to target the HER2 protein.

Anti-angiogenesis drugs: In order for cancers to grow, blood vessels must develop to nourish the cancer cells. This process is called *angiogenesis*. Looking at angiogenesis in breast cancer specimens can help predict prognosis. Some studies have found that breast cancers surrounded by many new, small blood vessels are likely to be more aggressive. More research is needed to confirm this.

Bevacizumab (Avastin) is an example of anti-angiogenesis drug. Although the value of bevacizumab for breast cancer is currently uncertain, clinical trials are currently testing several other anti-angiogenesis drugs.

Other new drugs are also being developed that may be useful in preventing new blood vessels from forming. Several of these drugs are now being tested in clinical trials.

Drugs that target EGFR: The epidermal growth factor receptor (EGFR) is another protein found in high amounts on the surfaces of some cancer cells. Some drugs that target EGFR, such as cetuximab (Erbitux®) and erlotinib (Tarceva®), are already used to treat other types of cancers, while other anti-EGFR drugs are still considered experimental. Studies are now under way to see if these drugs might be effective against breast cancers.

Other targeted drugs: Everolimus (Afinitor®) is a targeted therapy drug that is approved to treat kidney cancer. In one study, letrozole plus everolimus worked better than letrozole alone in shrinking breast tumors before surgery. More studies using this drug are planned.

Many other potential targets for new breast cancer drugs have been identified in recent years. Drugs based on these targets are now being studied, but most are still in the early stages of clinical trials.

Bisphosphonates

Bisphosphonates are drugs that are used to help strengthen and reduce the risk of fractures in bones that have been weakened by metastatic breast cancer. Examples include pamidronate (Aredia) and zoledronic acid (Zometa).

Some studies have suggested that zoledronic acid may help other systemic therapies, like hormone treatment and chemo) work better. In one study, the women getting zolendric acid with chemo had their tumors shrink more than the women treated with chemo alone. In other studies, giving zoledronic acid reduced the risk of the cancer coming back. More studies are needed to determine if bisphosphonates should become part of standard therapy for early-stage breast cancer.

Vitamin D

A recent study found that women with early-stage breast cancer who were vitamin D deficient were more likely to have their cancer recur in a distant part of the body and had

a poorer outlook. More research is needed to confirm this finding, and it is not yet clear if taking vitamin D supplements would be helpful. Still, you may want to talk to your doctor about testing your vitamin D level to see if it is in the healthy range.

Denosumab

When cancer spreads to the bone, it causes increased levels of a substance called RANKL, which is important in bone metabolism. Higher levels stimulate cells called *osteoclasts* to destroy bone. A newer drug called *denosumab* (Xgeva™, Prolia™) inhibits (acts against) RANKL and can help protect bones. When given to patients with breast cancer that had spread to the bone, it helped prevent problems like fractures (breaks) better than zoledronic acid (Zometa). It also seems to help even after bisphosphonates stop working. Denosumab was recently approved to treat patients with cancer that has spread to bone. This drug is given as an injection under the skin every 4 weeks. Side effects include low blood levels of calcium and phosphate, as well as the jaw bone problem known as *osteonecrosis of the jaw*. Studies continue to see if giving denosumab to patients with early breast cancer can help prevent the disease from spreading.

Additional resources

More information from your American Cancer Society

The following related information may also be helpful to you. These materials may be ordered from our toll-free number, 1-800- 227-2345.

- After Diagnosis: A Guide for Patients and Families (also available in Spanish)
- Bone Metastasis
- Breast Cancer Dictionary (also available in Spanish)
- Breast Cancer Early Detection (also available in Spanish)
- Breast Prostheses and Hair Loss Accessories List
- Breast Reconstruction After Mastectomy (also available in Spanish)
- Chemo brain
- Clinical Trials: What You Need to Know
- DES Exposure: Questions and Answers
- Exercises After Breast Surgery (also available in Spanish)
- Fatigue in People with Cancer
- Genetic Testing: What You Need to Know

- Inflammatory Breast Cancer
- Is Abortion Linked to Breast Cancer?
- Living With Uncertainty: The Fear of Cancer Recurrence
- Lymphedema: What Every Woman With Breast Cancer Should Know
- Mammograms and Other Breast Imaging Procedures
- Medicines to Reduce Breast Cancer Risk
- Non-cancerous Breast Conditions (also available in Spanish)
- Pregnancy and Breast Cancer
- Sexuality for the Woman with Cancer (also available in Spanish)
- Talking with Your Doctor (also available in Spanish)
- Understanding Chemotherapy (also available in Spanish)
- Understanding Radiation Therapy (also available in Spanish)
- When Your Cancer Comes Back: Cancer Recurrence

Books

The following books are available from the American Cancer Society. Call us at 1-800-227-2345 to ask about costs or to place your order.

Breast Cancer Clear and Simple

Caregiving: A Step-By-Step Resource for Caring for the Person with Cancer at Home

Couples Confronting Cancer

Lymphedema:Understanding andManaging Lymphedema After Cancer Treatment

National organizations and Web sites*

In addition to the American Cancer Society, other sources of patient information and support include:

National Breast Cancer Coalition
Toll-free number: 1-800-622-2838
Web site: www.stopbreastcancer.org

National Cancer Institute
Toll-free number: 1-800-4-CANCER (1-800-422-6237)
Web site: www.cancer.gov

Susan G. Komen for the Cure
Toll-free number: 1-877-465-6636
Web site: www.komen.org

Y-Me National Breast Cancer Organization (formerly Breast Cancer Network of Strength)
Toll-free number: 1-800-221-2141, 1-800-986-9505 (Spanish)
Web site: www.networkofstrength.org

Centers for Disease Control and Prevention (CDC)
Toll-free number: 1-800-232-4636 (1-800-CDC INFO)
Web site: www.cdc.gov

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345** or visit www.cancer.org

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